Final

Warmhouse Beach Dump Event 1 Field Data Report

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Contents

Figures

Acronyms and Abbreviations

ALS	ALS Environmental Laboratory
CLP	Contract Laboratory Program
COC	chain of custody
CSM	conceptual site model
DQO	data quality objectives
EAS	Environmental Assessment Services LLC
EPA	U.S. Environmental Protection Agency
FD	field duplicate
FSP	Field Sampling Plan
GIS	geographic information system
GPS	global positioning system
MECRO	Makah Employment and Contracting Rights Office
MEL	Manchester Environmental Laboratory
MS/MSD	matrix spike/matrix spike duplicate
NOAA	National Oceanic and Atmospheric Agency
PA	Preliminary Assessment
PCB	polychlorinated biphenyls
PPE	personal protective equipment
PTFE	polytetrafluoroethylene
QAPP	quality assurance project plan
QC	quality control
RI/FS	Remedial Investigation and Feasibility Study
RSCC	Regional Sample Control Coordinator
SI	Site Inspection
SVOC	semi-volatile organic compounds
TAL	target analyte list
U.S.	United States
VOC	volatile organic compounds
WA	Washington
WBD	Warmhouse Beach Dump

SECTION 1

Introduction

This report provides a summary of the field activities and results for the Event 1 remedial investigation/feasibility study (RI/FS) field work that was conducted in March 2016 by CH2MHill (CH2M) on behalf of the U.S. Environmental Protection Agency (EPA) at the Warmhouse Beach Dump Site in Neah Bay, Washington. The field activities associated with Event 1 were conducted under an EPA-approved quality assurance project plan (QAPP) for the study (CH2M, 2016). The overall objective of the Event 1 RI/FS field work was to fill data gaps related to the nature and extent of contamination, waste volume, waste characteristics, and other elements of the conceptual site model (CSM) so that potential risks to human health and the environment can be assessed and remedial alternatives to mitigate identified risks can be developed. Event 1 was one of up to three field events planned to gather data to fill the RI/FS data gaps.

1.1 Background

The Warmhouse Beach Dump Site is located on the Makah Indian Reservation about three miles northwest of Neah Bay in Clallam County, Washington (Figure 1-1). The Site is an inactive dump that was used by the Makah Air Force Station, the Makah Tribe and tribal members, other local and non-local residents, and other entities such as the Indian Health Service, U.S. Coast Guard and Cape Flattery School District, to dispose of municipal solid and hazardous wastes. The dump was in use from the 1970s until 2012, when a solid waste transfer station operated by the Makah Tribe opened on the Reservation. When it was closed, the dump was about 7 acres in size and located along a ridgeline on a bluff overlooking the Strait of Juan de Fuca.

Drainage from the WBD reaches West and East Creeks, which discharge to Warmhouse and East Beaches, respectively, and into the Olympic Coast National Marine Sanctuary along the Strait of Juan de Fuca. The marine sanctuary provides habitat for twenty nine species of marine mammals and 90 species of marine birds that reside in or migrate through the Olympic Coast National Marine Sanctuary, including whales and porpoises, seals and sea lions, and sea otters (National Oceanic and Atmospheric Agency [NOAA, 2010]). Sport, commercial and Tribal fishing occurs downstream of the Site in the Strait of Juan de Fuca (EPA, 2013). Warmhouse Beach was the site of historical fishing camps and traditionally was used for cultural and religious ceremonies and contains a designated archeological site of cultural significance to the Makah people (Makah Tribe, 2015). The beaches and the headlands provided subsistence harvest of shellfish, seaweed, and berries (i.e., salmonberry, blackberry). The area is also a remote but popular recreational site for locals and tourists who surf, camp, and bird.

The dump is located 3 miles east of Cape Flattery, a strategic and sentinel promontory overlooking the intersection between the trans-Pacific, coastal, and Strait of Juan de Fuca inland trade waterways. The cape is an international ecotourism visitor destination as the most northwest point in the contiguous United States, and is the location of the Cape Flattery Scenic Byway (SR 112), loop road and trail, visited by people from around the world. Game animals are hunted and berries are harvested here by Tribal members. Visitors on the loop road and trail also pick and eat the berries.

The Makah Tribe referred the Site to EPA due to concerns about hazardous substances leaching from the waste and contaminated soil to surface water and to shellfish beaches on the reservation (EPA, 2013). A Preliminary Assessment (PA) (Techlaw, 2010a) reported that semi-volatile organic compounds (SVOCs), pesticides, diesel, motor oil, metals, dioxins/furans, and other organic chemicals were present at significant concentrations in soil at the dump. A Site Inspection (SI) (Ecology & Environment, 2012) indicated that polychlorinated biphenyls (PCBs) and perchlorate are also present in soil and that sediment in creeks that drain the dump and along beaches downstream of the dump may also have been impacted by releases from the dump.

1.2 Document Organization

This report is organized into the following sections:

- **Section 1 – Introduction.** This section provides background information for the study and outlines the report organization.
- **Section 2 – Study Design.** This section describes the purpose and objectives of the study and provides an overview of the study design.
- **Section 3 – Field Activities.** This section identifies the methods used to collect the Event 1 samples and discusses any changes or deviations from the QAPP and field sampling plan (FSP).
- **Section 4 – References.** This section presents bibliographic information for the documents cited within this report.
- Figures and data tables are provided following Section 4.

Field records and supporting information for Event 1 are provided in the following appendices:

- **Appendix A** – Topographic Map
- **Appendix B** – Geophysical Survey Report
- **Appendix C** – Stream Gaging Data and Calculations
- **Appendix D** – Field Sampling Records and Photographs

SECTION 2

Study Design

2.1 Purpose of Study

The purpose of Event 1 was to collect data to fill data gaps related to the nature and extent of contamination, waste volume, waste characteristics, and other elements of the CSM so that potential risks to human health and the environment can be assessed and remedial alternatives to mitigate identified risks can be developed. The following RI/FS data gaps were expected to be filled or partially filled using data from Event 1:

- **Design and Implementation of Remedial Action:**
  - Detailed topography of the dump and surrounding area
  - Current volume and composition of waste
  - Geotechnical properties of the waste and surrounding soil
- **Characterize Potential Releases to Surface Water:**
  - Elevated concentrations of metals, 1,2-dichloroethane, and perchlorate have been detected in surface water samples collected at the site. While there are abundant analytical data for East and West Creeks and background locations, there is limited information about hydrological conditions in the creeks at the time of sampling. Additionally, an unnamed stream that drains a ravine on the north side of the dump has not been sampled. Stream gaging and additional samples from the creeks, unnamed stream, and from background locations are needed to characterize contaminant concentrations in the creeks during the wet and dry seasons.
  - Seeps from saturated waste layers may be contributing contaminants to East and West Creeks. The locations, chemical content, and discharge rates for these seeps during the wet and dry seasons need to be assessed.

2.2 Study Design

The basis of the study design for Event 1 was detailed in Appendix A (Data Quality Objectives) of the QAPP. The overall design is described below and summarized in Table 2-1:

2.2.1 Topographic Survey

A topographic survey of the approximately 7 acre site, including the dump, surrounding area, and tree line, was to be conducted. Data were to be collected using a combination of ground-based survey techniques sufficient to create a 2-foot contour map and a digital terrain model.

2.2.2 Geophysical Survey

An electrical resistivity survey to estimate the thickness of waste in the dump was to be conducted. The survey was to consist of seven resistivity transects, arranged as four lines in one direction and three lines crossing perpendicular to make a semi-grid pattern across the dump. Vertical resolution was expected to be approximately $\pm$ 3 feet but would be dependent on actual site conditions, including waste conductivity and sharpness of the bedrock boundary. The locations of the resistivity transects were to be determined based on conditions encountered in the field.

2.2.3 Seep and Surface Water Field Activities

Seep and surface water data acquisition sampling activities were to take place during Event 1, as well as up to 2 additional events (Events 2 and 3) that would have field efforts similar those listed below. Data from

Event 1 was to be reviewed and evaluated prior to conduct of the future events to ensure that the design will achieve project objectives.

2.2.3.1 Stream Gaging

Temporary stream gaging transects were to be located along each of the creeks and water ways that drain the WBD Site, including East Creek, West Creek, and an unnamed stream that appears to drain the northwest portion of the dump. Stream gaging was to occur at locations near the dump and downstream of the dump. The locations of stream gaging transects were to be based on field conditions (relatively uniform channel free of boulders, fallen trees, and aquatic vegetation). Stream gaging was to consist of determining the cross-sectional area (width and depth) of each transect location using a measuring tape and determining the spacing for flow measurements. Flow measurements were to be made using a portable water velocity meter at each transect location.

Flow measurements were to be conducted at the same transect locations during the wet season and dry seasons, and possibly, in-between those seasons.

2.2.3.2 Seep Survey

A one-day visual and instrument (thermometer) survey of the dump area was to be conducted to identify possible seeps from water-saturated portions of the waste pile. The survey was to focus on the base of waste piles and along the portions of East and West Creeks that flow over and out from the dump. Seeps along the base of the dump were to be identified visually based on the presence of erosion rills, areas of surface staining and/or stressed vegetation, and wet or saturated areas resulting from seeping liquid. The visual surveys along East and West Creeks was to be augmented by temperature profiling to locate areas along the creek where seeps may be entering the creeks. Each identified seep was to be given a location identification number and its global positioning system (GPS) coordinates were to be documented.

2.2.3.3 Seep Sample Collection

Up to 12 seeps were to be selected for sampling based on conditions observed during the survey. The seep water samples were to be analyzed for total and dissolved target analyte list (TAL) metals including mercury, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs), pesticides, and perchlorate. Temperature, conductivity, and pH readings were to be measured using a calibrated water quality meter and recorded at the time of sample collection.

Samples to be analyzed for dissolved TAL metals and perchlorate were to be filtered in the field using in-line 0.45 micron syringe capsule filters (metals) and 0.2 micron polytetrafluoroethylene (PTFE) syringe filters (perchlorate) prior to placement in preserved (nitric acid for metals) and unpreserved (perchlorate) sample containers as required by the analytical methods.

2.2.3.4 Surface Water Sample Collection

Surface water in East Creek, West Creek, Kydikabbit Creek, the unnamed stream, and background locations were to be sampled. The sample locations were to be distributed as follows:

- East Creek – 3 samples
- Kydikabbit Creek (downstream of confluence with East Creek) – 2 samples
- West Creek – 6 samples
- Unnamed Stream that appeared to drain northwest side of dump – 2 samples
- Background - 5 samples along Classet Creek and 5 samples along Kydikabbit Creek upstream of the confluence with East Creek

The surface water samples were to be analyzed for total and dissolved TAL metals including mercury, VOCs, SVOCs including PAHs, pesticides, and perchlorate. Temperature, conductivity, and pH were to be measured using a calibrated water quality meter and recorded at the time of sample collection.

Samples to be analyzed for dissolved metals and perchlorate were to be filtered in the field using in-line 0.45 micron syringe capsule filters (metals) and 0.2 micron PTFE syringe filters (perchlorate) prior to placement in preserved (nitric acid for metals) and unpreserved (perchlorate) sample containers as required by the analytical methods.

SECTION 3

Field Activities

The Event 1 field activities were outlined in the EPA-approved QAPP (CH2M, 2016) and detailed in the field sampling plan (FSP), which was Appendix B of the QAPP. The field work was also authorized by the Makah Employment and Contracting Rights Office (MECRO) under a compliance agreement dated March 14, 2016. Field work was conducted by CH2M personnel and CH2M subcontractors. Field oversight was provided by the EPA, Makah environmental office personnel, and a representative the Makah's consultant, Environmental Assessment Services LLC (EAS). All field activities and sample collection methods were performed in accordance to the EPA-approved QAPP and FSP unless otherwise noted in Section 3.6. Table 3-1 provides a listing of personnel present during Event 1 and a chronology of the field work described in the following subsections.

3.1 Topographic Survey

The objective of the topographic survey was to use a combination of ground-based survey techniques to create a 2-foot contour map and a digital terrain model of the dump and nearby area. The topographic survey was conducted by Pacific Geomatic Services, Inc., a subcontractor to CH2M. Survey personnel were at the site from March 14 to March 18, 2016. A copy of the topographic map is provided in Appendix A. As indicated on the map, steep slopes and unstable areas within the dump could not be surveyed in detail. Consequently, topographic data for these area are from interpolation of adjacent survey data. The digital terrain model, which is based on the topographic data, will be incorporated into the geographic information system (GIS) for the WBD Site.

3.2 Geophysical Survey

The objective of the geophysical investigation was to evaluate the depth and lateral limits of the waste materials across the WBD Site to allow a determination of the volume of waste in the dump and the depth to bedrock below the waste. The geophysical survey consisted of electrical resistivity surveying. This geophysical method was selected to take advantage of physical property contrasts that are reflective of site conditions. For example, it was expected that the waste materials would present a significant contrast in electrical resistivity compared to the background marine geological bedrock. Previous experience at landfill sites tends to indicate that the waste materials associated with these sites are electrically conductive compared to the background geology or fill materials.

The geophysical survey, consisting of electrical resistivity, was completed at the WBD Site between March 15 and March 17, 2016. The geophysical survey consisted of seven survey lines of electrical resistivity varying in length between 450 and 670 feet, as shown in Figure 3-1. The site has significant topography and therefore survey line locations were selected in an effort to minimize extreme topographic changes along the survey lines.

Data were collected using a Supersting™ R8 multichannel electrical resistivity system (Advanced Geosciences, Inc., Texas) and associated cables, electrodes, and battery power supply. The stainless steel electrodes were laid out along lines with a constant electrode spacing of approximately 3 feet (1 meter). More information about the layout of the system and processing of the data is provided in Appendix B (Geophysical Survey Report).

The limitations and overall findings of the survey are detailed in Appendix B and summarized below:

- The Site has significant topographic variations across the site; with very steep slopes on most of the edges of the dump and a cliff style feature running approximately east-west through the middle of the site. Combined with the dense vegetation surrounding the dump site, this led to constraints, both safety

and logistical related, on where the electrical resistivity survey lines could be placed. It was not possible in the majority of cases to extend the electrical resistivity survey lines beyond the anticipated limits of the dumped waste materials, to both capture the true lateral limits of the waste materials and provide information on the background geological material responses for improved calibration of the resistivity values.

- The seven electrical resistivity survey lines provide a reasonable distribution of coverage (given the steep topography and dense vegetation) of the major areas of interest across the Site; namely the ravine area, the steep cliff style feature on the south side of the ridge, and on the north side of the ridge.
- The dumped waste materials presented as a predominantly resistive near-surface layer in the model resistivity results. A number of highly conductive regions within this layer are interpreted as potentially responses to high concentrations of metallic waste or where leachate from decomposing waste materials may be concentrated.
- The interface between the waste material and underlying geological bedrock was digitized from the model resistivity profiles and analyzed to produce a map of the spatial distribution of the thickness of dumped waste (Figure 3-1). This indicates a significant thickness of waste materials in the east to west trending ravine area. There was poor coverage of the very steep cliff feature apart from the region around Line 2, but this indicates between approximately 20 to 30 feet thickness of waste material making up this steep slope[1]. The area on the north/northeast limits of the dump display the thickest consistent covering of waste material, with on average approximately 40 to 50 feet of waste material indicated.

The inferred waste thickness data shown in Figure 3-1 has been incorporated into the GIS for the WBD Site and will be used along with the topographic data and Event 2 test pit or soil boring results to estimate the volume of waste at the dump.

3.3 Stream Gaging

Stream gaging was conducted as planned at two transects along East Creek, two transects along West Creek, and one transect at the mouth of Unnamed Stream A. Stream gaging was also conducted at one transect across the mouth of the unnamed stream that discharges at East Beach (Unnamed Stream B) and at one transect across the mouth of Classet Creek where it discharges to Warmhouse Beach. The locations of the stream gaging transects are shown in Figure 3-2. The cross-sectional areas and flow measurements at each transect location are provided in Appendix C. The calculated flow rates at each gaging station are summarized in Table 3-2.

3.4 Seep Reconnaissance

Visual seep reconnaissance was conducted on March 14 and 15, 2016 following a weekend of heavy rain. The survey focused on the base of waste piles and along the portions of East and West Creeks that flow over and out from the dump, as well as the upper portion of Unnamed Steam A, which was located during the course of seep reconnaissance on the north side of the dump. Five potential seeps were identified based on the presence of ponded water, visible flow, and/or wet or saturated areas resulting from seeping liquid. No seeps were identified based on the presence of erosion rills, areas of surface staining, or stressed

[1] No intrusive work (i.e. excavation or drilling) has been conducted to constrain the values in electrical resistivity. Such intrusive work is needed to better identify the interface between the underlying geological bedrock and waste materials in the Warmhouse Beach Dump. The interpretation in Figure 3-1 is based off understanding and assumptions made of the site and informed interpretations of the model resistivity results. Having additional information from drilling or borings would allow better determination the thickness of waste material, and confirm and improve the resolution of the presented interpretation.

vegetation. The locations of the seeps are shown in Figure 3-3 and descriptions of the seeps are provided in Table 3-3. Temperature profiling was not performed because water depths in the creeks were shallow (less than two inches) and seepage from the dump was visually evident.

3.5 Sampling

Sampling activities were conducted from March 15 through March 22, 2016. Surface water sampling was conducted at the 13 planned surface water locations within and downstream of the dump and at one additional (unplanned) location at the mouth of Unnamed Stream B, a stream that had not been observed previously at the site. Seep samples were collected at four of the five identified seeps (SP-01 was not sampled because no water was presents at the location after one day of dry weather). Surface water and seep sample locations at the Site are shown in Figures 3-2 and 3-3. Background samples were collected at five locations along Classet Creek and its tributaries, one location in Kydikabbit Creek upstream of the confluence with East Creek, and, because the remainder of the upper portion of Kydikabbit Creek was inaccessible, four locations in creeks and ponds located along Koitlah Point Road, east of Kydikabbit Creek (Figure 3-4). Sample collection information is summarized in Table 3-4, field water quality measurements are listed in Table 3-5, and sampling records are provided in Appendix D. The samples were analyzed for perchlorate by EPA's Manchester Environmental Laboratory (MEL) in Port Orchard, Washington and for the other analytical suites by ALS Environmental (ALS) in Salt Lake City, Utah, under the EPA contract laboratory program (CLP).

3.5.1 Sample Collection Procedures

Sample locations were accessed by foot. Equipment and supplies to be used during sampling included a GPS unit[2], sample forms, camera, sample bottles, filters (0.45 micron and 0.2 micron), water quality meter, ice, sample coolers, personal protective equipment (PPE), and decontamination supplies. The water quality meter was calibrated at the beginning of each day; calibration records are included in the field notes provided in Appendix D.

The procedure for sample collection is described below:

1. Re-locate the seep or sample locations and record GPS coordinates and water quality parameters identified on the Surface Water or Seep Sample Collection form. Photograph and describe the sample location in the photo log. Exercise caution not to disturb any sediment at or above the sample location.
2. Label the sample bottles and record all applicable information in the field logbook.
3. Remove surface material and debris so that water flow is visible. Estimate the flow rate and record on the Surface Water or Seep Sample Collection form.
4. With minimum surface disturbance, submerge an unpreserved sample bottle (at least 500 milliliters [mL]) with the mouth of the container facing upstream and allow water to flow gently into the bottle. It may be necessary to refill the bottle several times.
5. Fill the sample containers in the following order:
    a. VOCs (pre-preserved container)
    b. Total metals (pre- preserved container)
    c. Dissolved metals - transfer the sample to the pre-preserved sample container using a hand-held syringe and a 0.45 micron filter. A new filter was used for each water sample location.

[2] GPS coordinates could not be obtained at many sample locations due to interferences from heavy vegetation.

d. Perchlorate - transfer the sample into the unpreserved sample container using a hand-held syringe and a 0.2 micron PTFE filter. A new filter was used for each water sample location.

e. SVOCs

f. Pesticides

Additional volumes of water for field duplicates (FDs) and matrix spike/matrix spike duplicates (MS/MSDs) were obtained from the same sampling equipment as the parent samples.

6. After sample aliquots are collected, the field water quality parameters (conductivity, pH, temperature, and dissolved oxygen) were measured using the water quality meter and the procedures in the manufacturer's manual. The water quality readings were recorded on the Surface Water and Seep Sample Collection forms.

7. Decontaminate equipment prior to collecting sample from next location.

The surface water and seep water samples were stored on ice under custody control packaging and shipment to the laboratories for analysis.

3.5.2 Sample Numbering

In addition to Region 10 -generated sample identification numbers, which were used to track samples and analytical data in the Scribe.net environment (EPA, 2014), a field sample numbering scheme that allowed each sample to be uniquely identified and provides a means of tracking the sample from collection through analysis was used. The numbering scheme indicates the location and sample type. The unique sample number was entered in the field notebook, field forms, and other records documenting sampling activities. The field sample designation was also entered into the "Remarks" field in the Scribe.net environment. The following sample number convention was used for normal and field duplicate samples:

Location Prefix – Medium - Location ID

Explanation:

Location Prefix:	2016WB
Medium:	SW = surface water
Location:	EC = East Creek
	WC = West Creel
	KC = Kydikabbit Creek
	USA = Unnamed Stream A
	USB = Unnamed Stream B
	BKGD = Background
	SP = Seep

3.5.3 Field Quality Assurance and Quality Control

Quality control (QC) samples collected in the field will be used to assess the overall quality of the project data. Field QC samples associated with Event 1include FDs, MS/MSD, filter blanks, and temperature blanks. Duplicate discharge measurements and field parameters were also collected at a frequency of 10 percent of all sample locations.

3.5.3.1 Field Duplicate Samples

FDs are duplicate samples collected at the same locations as the parent sample to evaluate the variability of concentrations in the media being collected. FDs were collected and analyzed at a frequency of 10 percent

of all samples (FDs are listed as separate samples in Table 3-4). Duplicate samples were submitted to the laboratories blind. Analyses were the same as those required by the parent sample.

3.5.3.2 Matrix Spike/Matrix Spike Duplicates Samples

MS/MSDs were collected and analyzed at a frequency of 5 percent of total samples (see comments in Table 3-4). MS/MSD samples were designated as such on the chain-of-custody form. Analyses were the same as those required by the parent sample.

3.5.3.3 Trip Blanks

Trip blanks consisting of ASTM Type II water (purchased and certified from a commercial vendor) placed in 40 milliliter volatile organic analysis vials were used to evaluate possible cross-contamination from ambient sources during collection and shipment of samples. A trip blank accompanied each cooler containing samples to be analyzed for VOCs. Trip blank information is provided in Table 3-4.

3.5.3.4 Filter Blanks

Filter blanks were collected for the project per lot of filters used in the field for dissolved metals analysis and for perchlorate analysis. One set of filter blanks was collected prior to field mobilization to insure the filters were appropriate for use in the field, and one set was collected during the field event to identify potential contamination introduced in in the field. ASTM Type II water (purchased and certified from a commercial vendor) was poured over or through the sampling device and collected in a sample container to create the filter blanks for analysis.

3.5.3.5 Temperature Blanks

All coolers contained a temperature blank. The temperature blank consisted of a 40-milliliter volatile organic analysis vial filled with water and placed inside the cooler. Each vial was clearly marked “TEMPERATURE.”

3.5.4 Sample Management and Shipping

The samples were managed and shipped to MEL (perchlorate analysis) and ALS (remaining analyses) in accordance with the procedures detailed in the FSP and with the procedures for sample packaging and transportation, sample labeling, and sample documentation in the Region 10 Data Management Plan (EPA, 2014).

Each sample container was labeled using labels generated with the Scribe software. One label was attached to each sample container. The sample label was completed using indelible ink and included the following:

- Sample number
- Case number
- Analysis requested (including specific constituents requested)
- Preservative used (“NA” if not applicable)
- Date and time of sample collection
- Sampler’s initials

Sample labels were affixed to the sample containers and covered with clear packaging tape. The sample container was wrapped in bubble wrap and individually placed in re-sealable bags (one container per bag), which was then stored in an ice-filled cooler for temporary storage prior to, and during, shipment to the laboratory.

The following steps were followed to prepare sample coolers for shipment to the laboratory:

- All previous labels were removed from the cooler.
- All drain plugs were sealed with tape (inside and outside).
- Ice was placed in double, 1-gallon re-sealable bags.

The following steps were followed for packing samples in coolers:

- The signed chain-of-custody form was placed in a resealable plastic bag that was taped to the interior of the cooler lid.
- A plastic drum liner type bag was placed in the cooler to hold the samples, double-bagged ice, and packing material.
- A single layer of samples as placed in an upright position within the drum liner bag within the cooler.
- The void space between samples was filled with double-bagged ice and bubble wrap.
- Double-bagged ice was placed on top of and between the samples.
- The drum liner bag was closed and secured with a custody seal to maintain custody in the event the cooler opened during shipment

The coolers were secured with packing tape and custody seals as follows:

- The cooler lid was secured with strapping tape, encircling the cooler several times.
- Custody seals were placed on two sides of the lid (one in front, and one on the side) and covered with tape to prevent inadvertent breaking of the seals.
- Arrows indicating “This Side Up” were placed on the sides of the cooler.
- The shipping air bill was securely attached to the exterior of the cooler.

The coolers were shipped to the designated analytical laboratory by overnight courier

The Region 10 Regional Sample Control Coordinator (RSCC) was contacted on the day of sample shipment and provided the following information:

- Sampling contractor’s name
- Site name and/or case number and project code
- Total number(s) by concentration and matrix of samples shipped to each laboratory
- Carrier, air bill number(s), method of shipment (priority next day)
- Shipment date and intended laboratory receipt date
- Irregularities or anticipated problems associated with the samples
- Whether the current shipment is the final shipment or if additional samples will be shipped under the same case number

In addition, the COC XML file was uploaded to the Sample Management Office portal for CLP samples. The chain of custody (COC) XML and required XLS file were submitted to the R10 RSCC on the day of shipment for all samples with shipment notification information.

For Friday shipments, the RSCC and ALS were contacted prior to noon Friday to coordinate sample shipments that were to arrive on Saturday. Although arrangements were made for Saturday delivery at ALS on one occasion, FedEx was unable to deliver the coolers as scheduled. The coolers arrived instead on Monday, but there were no issues with sample temperatures.

3.5.5 Field Documentation

All sampling and associated activities field activities were documented on activity-specific field forms, field logbooks, and digital photographs. Scanned copies of the field records for each sample are provided in Appendix D.

3.5.5.1 Field Logbook

Daily field activities were documented through journal entries in a bound field logbook by each field team and the field manager for the duration of the residential sampling effort. The field logbooks contain all pertinent information about staff present, site arrival and departure times, health and safety pre-task meetings, sampling activities, site conditions, field methods, site sketches, general observations, and other pertinent technical information. Field book entries followed general accepted professional standards and procedures described in the FSP. Copies of the field logbooks for Event 1 are provided in Appendix D.

3.5.5.2 Digital Photographs

Digital photographs were shot during sampling activities to document sampling procedures, site locations and conditions, and other pertinent activities. Photographs were shot of each sampling location. A dry-erase white boards bearing the property name, DU, date and time, and sample Identification (where applicable) was held in the photograph for reference. The photo number and description of the photograph (including direction) were entered sequentially into the dedicated Photo Log field form for each property. Copies of the photographs are provided in Appendix D and are organized by sample date.

3.5.5.3 Dedicated Field Forms

All sampling and associated activities were documented on activity-specific field forms. Copies of the forms are included in Appendix D.

3.5.6 Equipment Decontamination

Only dedicated or disposable sample collection equipment was used to collect the seep and surface water samples so decontamination of sampling equipment was not required. The probe on the water quality meter was the only reusable equipment employed during the sampling event. The probe was decontaminated between sample locations by washing it with a solution of tap water and Alconox followed by a rinse of distilled water.

3.5.7 Waste Disposal

Waste generated during fieldwork included PPE, disposable items (such as filters), and decontamination wash water. All general refuse (such as gloves, paper towels, and filters) that did not likely contain hazardous material were disposed of at the Neah Bay Transfer Station. The volume of decontamination fluids generated during the project was very small and discharged to the ground at the sample location.

3.6 Field Modifications

The following modifications to the QAPP/FSP were needed based on conditions encountered in the field during Event 1:

- Steep slopes and unstable ground prevented acquisition of topographic and geophysical data in certain portions of the dump. Data from adjacent surveyed areas was interpolated across these areas in the topographic and geophysical surveys.
- Heavy vegetation interfered with use of the GPS unit to identify GPS coordinates at many stream gaging transects and sample locations. The transect and sample locations were hand-drawn on maps and marked with flagging for re-surveying of coordinates using more robust GPS equipment during a future sampling event.
- Stream gaging transects were added at the small unnamed stream that discharges at East Beach (Unnamed Stream B) and at the mouth of Classet Creek where it discharges to Warmhouse Beach in order to have stream flow data to accompany sample results from these locations.
- Temperature profiles were not used to identify potential seeps along East Creek and West Creek because water depths in the creeks were shallow (less than two inches) and seeps were visually evident.
- Ponded water indicating a possible seep in the east center portion of the dump could not be sampled because water was no longer present approximately one day after a rain event.
- A surface water sample from the mouth of previously unknown Unnamed Stream B was added to the sampling program.
- Four planned background samples along the upper portion of Kydikabbit Creek had to be moved to locations in creeks and ponds along Koitlah Point Road because of access issues.

None of these modifications is expected to adversely impact decisions associated with use of the Event 1 data.

References

CH2MHill. 2015. Draft Conceptual Site Model and Data Gaps Report for Warmhouse Beach Dump Superfund Site. Prepared for EPA.

CH2M, 2016. Final Event 1 Quality Assurance Project Plan Warmhouse Beach Dump Superfund Site. Prepared for EPA.

Ecology & Environment, 2012. Final Site Inspection Report, Makah Reservation Warmhouse Beach Dump, Neah Bay, Washington.

EPA, 2013. Hazard Ranking System Documentation for Warmhouse Beach Dump Site.

EPA, 2014. R10 Data Management Plan.

Makah Tribe, 2015. Email from Patricia Barrows (Makah Tribe) to Piper Peterson (EPA) on January 26, 2015.

National Oceanic and Atmospheric Administration (NOAA), 2010. Olympic Coast National Marine Sanctuary. http://olympiccoast.noaa.gov/welcome.html. Accessed September 9, 2010.

TechLaw, Inc., 2010a, Preliminary Assessment Report, Makah Reservation Warmhouse Beach Open Dump, Neah Bay, Clallam County, Washington.

TechLaw, Inc., 2010b, Removal Assessment Report, Warmhouse Beach Open Dump, Neah Bay, Clallam County, Washington.

Tables

Table 2-1
Summary of RI/FS Sampling and Analysis Plan – Event 1
Warmhouse Beach Dump Event 1 Field Data Report

Activity	Rationale for Activity	Target Areas	Target Media	Sample Design	Primary Sample Count	QA/QC Sample Count	Sample Depths	Target Analyte Suites	Basis for Target Analyte Suites
Topographic Survey	Needed to estimate waste thickness and stability for development of remedial options	Dump and surrounding area	Not applicable	Elevation data will be collected using a combination of ground-based survey techniques sufficient to create a 2-foot contour map and digital terrain model	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Geophysical Survey	Estimate waste thickness and depth to bedrock, develop and evaluate remedial options	Dump	Waste and bedrock	Seven electrical resistivity transects, arranged as four lines in one direction and three lines crossing perpendicular to make a semi-grid pattern across the dump. Vertical resolution is expected to be approximately ± 3 feet but will depend on actual site conditions. Locations of the resistivity transects will be determined based on conditions encountered in the field.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Seep survey (wet season))	Locations and flow rates of seeps are unknown and may change between seasons	Base of waste piles and along upper reaches of East and West Creek	Water seeping from dump	Judgmental – Visual survey and temperature profiles	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Stream gaging (wet season)	Flow rates and volumes in East and West Creeks are unknown and may change between seasons	East and West Creeks	Surface water	Judgmental - Headwaters and discharge locations for East and West creeks	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Surface water sampling (wet season)	Need contemporaneous surface water results to assist in interpretation of seep data	Lengths of East and West Creeks Unnamed creek/ravine at Warmhouse Beach	Surface water	Judgmental – sample locations based on results from existing sample locations, site visit, and need for contemporaneous sample coverage along length of each creek	13 grab samples	2 FD 1 MS 1 MSD VOC trip blanks[b]	Not applicable.	TAL metals[a] VOCs SVOCs Pesticides Perchlorate Temperature Conductivity pH Discharge rate	Results of comparisons of historical surface water data from East and West Creeks to human health and ecological screening levels (CH2M, 2015)
Background surface water sampling (wet season)	Need contemporaneous surface water results to assist in characterizing background concentration in site surface water and seep samples.	Freshwater creeks in upland locations thought to be unaffected by the dump.	Surface water	Judgmental – sample locations based on results from existing background sample locations and consultation with Makah Tribe	10 grab samples	1 FD 1 MS 1 MSD VOC trip blanks[b]	Not applicable.	TAL metals[a] VOCs SVOCs Pesticides Perchlorate Temperature Conductivity pH Discharge rate	Matches target analytical suites for Site seep and surface water samples
Seep sampling (wet season)	Seeps from saturated waste layers may be contributing to surface water contamination in East and West Creeks.	Base of waste piles and along upper reaches of East and West Creek	Water seeping from dump	Judgmental – Sample locations to be determined based on results of seep survey	Up to 12 grab samples	1 FD 1 MS 1 MSD VOC trip blanks[b]	Not applicable,	TAL metals[a] VOCs SVOCs Pesticides Perchlorate Temperature Conductivity pH Discharge rate	Results of comparisons of historical surface water data from East and West Creeks to human health and ecological screening levels (CH2M, 2015)

[a] Total and dissolved metals
[b] VOC trip blanks will be prepared and shipped with each cooler containing the VOC aliquot for each sample

FD = field duplicate
MS = matrix spike
MSD = matrix spike duplicate
TAL = target analyte list
VOCs = volatile organic compounds
SVOCs = semi-volatile organic compounds

Table 3-1
Event 1 Personnel and Chronology of Field Activities
Warmhouse Beach Dump Event 1 Field Data Report

Date	CH2M Personnel	Subcontractor Personnel	Oversight Personnel	Activities
3/14/16	Marilyn Gauthier – CH2M John Culley – CH2M Evan Griffiths – CH2M	Jim Martin – Pacific Geomatic Services Inc. Kael Martin – Pacific Geomatic Services Inc.	Shawn Blocker – EPA Jason Thompson – Makah Tribe	Mobilization, coordination with Makah Tribe, reconnaissance of sample locations, vegetation removal, topographic survey
3/15/16	Marilyn Gauthier – CH2M John Culley – CH2M Mark Endo – CH2M Jeremiah Knuth – CH2M Kristen Stevens – CH2M Evan Griffiths – CH2M	Jim Martin – Pacific Geomatic Services Inc. Kael Martin – Pacific Geomatic Services Inc. Nigel Crook – Hydrogeophysics, Inc Marc Levitt - Hydrogeophysics, Inc	Shawn Blocker – EPA Patricia Barros – Makah Tribe Aaron Parker – Makah Tribe Jason Thompson – Makah Tribe	Reconnaissance of site and sample locations, vegetation removal, topographic survey, geophysical survey, stream gaging, surface water sampling
3/16/16	Marilyn Gauthier – CH2M Mark Endo – CH2M Jeremiah Knuth – CH2M Kristen Stevens – CH2M Evan Griffiths – CH2M	Jim Martin – Pacific Geomatic Services Inc. Kael Martin – Pacific Geomatic Services Inc. Nigel Crook – Hydrogeophysics, Inc Marc Levitt - Hydrogeophysics, Inc	Brett Tiller - EAS Aaron Parker – Makah Tribe Jason Thompson – Makah Tribe	Topographic survey, geophysical survey, stream gaging, surface water sampling, seep reconnaissance, background sample reconnaissance
3/17/16	Mark Endo – CH2M Jeremiah Knuth – CH2M Kristen Stevens – CH2M Evan Griffiths – CH2M	Jim Martin – Pacific Geomatic Services Inc. Kael Martin – Pacific Geomatic Services Inc. Nigel Crook – Hydrogeophysics, Inc Marc Levitt - Hydrogeophysics, Inc	Jason Thompson – Makah Tribe	Topographic survey, geophysical survey, stream gaging, surface water sampling
3/18/16	Mark Endo – CH2M Jeremiah Knuth – CH2M Kristen Stevens – CH2M Evan Griffiths – CH2M	Jim Martin – Pacific Geomatic Services Inc. Kael Martin – Pacific Geomatic Services Inc. Nigel Crook – Hydrogeophysics, Inc Marc Levitt - Hydrogeophysics, Inc	Jason Thompson – Makah Tribe	Topographic survey, geophysical survey, stream gaging, surface water sampling. Demobilize topographic and geophysical survey teams
3/19/16	Mark Endo – CH2M Jeremiah Knuth – CH2M Kristen Stevens – CH2M		Jason Thompson – Makah Tribe	Surface water and seep sampling
3/20/16	Mark Endo – CH2M Jeremiah Knuth – CH2M Kristen Stevens – CH2M		Jason Thompson – Makah Tribe	Surface water and seep sampling

Table 3-1

Event 1 Personnel and Chronology of Field Activities

Warmhouse Beach Dump Event 1 Field Data Report

Date	CH2M Personnel	Subcontractor Personnel	Oversight Personnel	Activities
3/21/16	Mark Endo – CH2M Jeremiah Knuth – CH2M Kristen Stevens – CH2M		Jason Thompson – Makah Tribe	Surface water and seep sampling
3/22/16	Mark Endo – CH2M Jeremiah Knuth – CH2M Kristen Stevens – CH2M		Jason Thompson – Makah Tribe	Surface water and seep sampling
3/23/16	Mark Endo – CH2M Jeremiah Knuth – CH2M Kristen Stevens – CH2M			Demobilize sampling team

Table 3-2

Summary of Stream Gaging Results - Event 1

Warmhouse Beach Dump Event 1 Field Data Report

Stream ID	Measurement Date/Time	Stream Cross-sectional Area (cubic feet)	Average Flow Velocity (feet/second)	Total Discharge Rate (cubic feet per second)	Total Discharge Rate (gallons per minute)
Classet Creek 1	3/15/16 13:26	6.988	1.76	15.808	7095.12
Unnamed Stream 1	3/15/16 15:40	0.068	0.62	0.044	19.89
West Creek 1	3/18/16 14:40	1.213	0.07	0.077	34.45
West Creek 2	3/15/16 15:00	0.363	0.84	0.361	161.94
East Creek 1	3/17/16 16:10	0.391	0.10	0.071	31.88
East Creek 2	3/16/16 11:20	0.322	0.33	0.131	58.82
Unnamed Stream B1	3/19/16 15:35	0.039	0.14	0.015	6.75
Unnamed Stream B1 - Duplicate	3/19/16 16:00	0.038	0.11	0.013	5.69

Table 3-3
Event 1 Seep Descriptions
Event 1 Warmhouse Beach Dump Field Data Report

Seep Number and Description	Photograph
SP-01 - Ponded water observed in south central portion of dump, below the steep slope. Water observed only on March 14, 2016 following heavy rain. Area was dry on subsequent days (Photo from March 22, 2016). Not sampled.	
SP-02 - Large area of ponded water on edge of waste-filled ravine on southeast margin of dump. Floating trash and tires on surface. Orange staining noted.	

Table 3-3
Event 1 Seep Descriptions
Event 1 Warmhouse Beach Dump Field Data Report

Seep Number and Description	Photograph
SP-03 - Water draining from waste along eastern bank of West Creek	
SP-04 – Damp area just uphill of West Creek, excavated to allow for sample collection	

Table 3-3
Event 1 Seep Descriptions
Event 1 Warmhouse Beach Dump Field Data Report

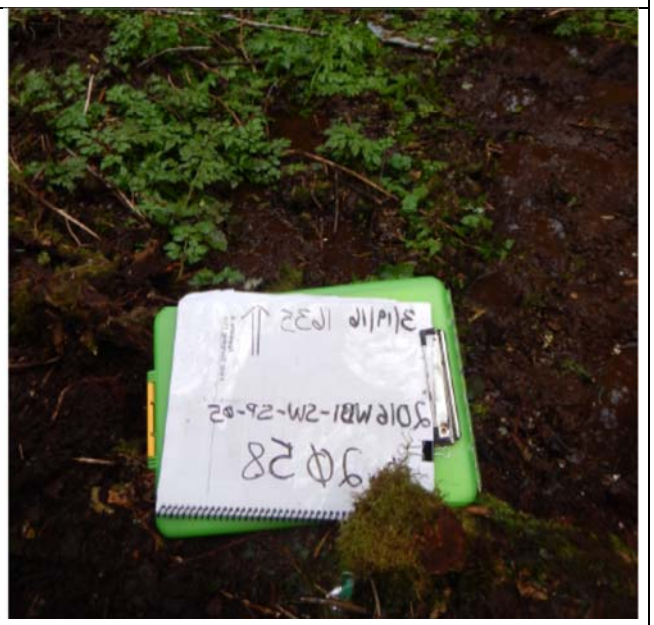
Seep Number and Description	Photograph
SP-05 – Damp area just uphill of Unnamed Stream A headwaters	

Table 3-4
Event 1 Sample Collection Information and Target Analyses
Warmhouse Beach Dump Event 1 Field Data Report

Location	Field Sample ID	Latitude	Longitude	Datum	Sample Date	Sample Time	Medium	Sample Type	Scribe Sample ID (unfiltered aliquot)	Analyses (unfiltered aliquot)	Scribe ID (0.45um filtered aliquot)	Analyses (0.45um filtered aliquot)	Scribe ID (0.2um filtered aliquot)	Analyses (0.2um filtered aliquot)	Comment
EC-01	2016WB1-SW-EC-01	48.388191	-124.65519	NAD83	3/17/2016	15:45	Surface Water	Field Sample	16114109	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114110	Dissolved Metals, Dissolved Hg	16114111	Perchlorate	
EC-02	2016WB1-SW-EC-02	48.388411	-124.65439	NAD83	3/16/2016	12:30	Surface Water	Field Sample	16114112	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114113	Dissolved Metals, Dissolved Hg	16114114	Perchlorate	
EC-02	2016WB1-SW-EC-902	48.388411	-124.65439	NAD83	3/16/2016	12:45	Surface Water	FD	16114115	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114116	Dissolved Metals, Dissolved Hg	16114117	Perchlorate	
EC-03	2016WB1-SW-EC-03	48.388786	-124.65384	NAD83	3/16/2016	11:15	Surface Water	Field Sample	16114118	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114119	Dissolved Metals, Dissolved Hg	16114120	Perchlorate	
KC-01	2016WB1-SW-KC-01	48.389443	-124.6535	NAD83	3/16/2016	15:15	Surface Water	Field Sample	16114121	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114122	Dissolved Metals, Dissolved Hg	16114123	Perchlorate	
KC-02	2016WB1-SW-KC-02	48.38977	-124.65373	NAD83	3/16/2016	16:00	Surface Water	Field Sample	16114127	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114128	Dissolved Metals, Dissolved Hg	16114129	Perchlorate	
US-01	2016WB1-SW-US-01	48.389858	-124.65996	NAD83	3/15/2016	15:40	Surface Water	Field Sample	16114100	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114101	Dissolved Metals, Dissolved Hg	16114102	Perchlorate	
US-02	2016WB1-SW-US-02	48.390131	-124.66043	NAD83	3/19/2016	15:00	Surface Water	Field Sample	16114154	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114155	Dissolved Metals, Dissolved Hg	16114156	Perchlorate	
USB-01	2016WB1-SW-USB-01	NR	NR	NR	3/19/2016	15:00	Surface Water	Field Sample	16114157	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114158	Dissolved Metals, Dissolved Hg	16114159	Perchlorate	
WC-01	2016WB1-SW-WC-01	48.388136	-124.65753	NAD83	3/18/2016	16:00	Surface Water	Field Sample	16114135	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114136	Dissolved Metals, Dissolved Hg	16114137	Perchlorate	
WC-02	2016WB1-SW-WC-02	48.388195	-124.6579	NAD83	3/19/2016	10:10	Surface Water	Field Sample	16114148	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114149	Dissolved Metals, Dissolved Hg	16114150	Perchlorate	
WC-03	2016WB1-SW-WC-03	48.388211	-124.65827	NAD83	3/18/2016	13:30	Surface Water	Field Sample	16114138	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114139	Dissolved Metals, Dissolved Hg	16114140	Perchlorate	
WC-04	2016WB1-SW-WC-04	48.388288	-124.65822	NAD83	3/18/2016	12:30	Surface Water	Field Sample	16114141	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114142	Dissolved Metals, Dissolved Hg	16114143	Perchlorate	
WC-05	2016WB1-SW-WC-05	48.388559	-124.65986	NAD83	3/19/2016	12:30	Surface Water	Field Sample	16114145	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114146	Dissolved Metals, Dissolved Hg	16114147	Perchlorate	
WC-06	2016WB1-SW-WC-06	48.389338	-124.66183	NAD83	3/15/2016	14:30	Surface Water	Field Sample	16114103	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114104	Dissolved Metals, Dissolved Hg	16114105	Perchlorate	MS/MSD
BKGD-01	2016WB1-SW-BKGD-01	NR	NR	NR	3/15/2016	13:26	Surface Water	Field Sample	16114124	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114125	Dissolved Metals, Dissolved Hg	16114126	Perchlorate	
BKGD-02	2016WB1-SW-BKGD-02	NR	NR	NR	3/21/2016	15:00	Surface Water	Field Sample	16124123	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124124	Dissolved Metals, Dissolved Hg	16124125	Perchlorate	
BKGD-03	2016WB1-SW-BKGD-03	NR	NR	NR	3/21/2016	16:00	Surface Water	Field Sample	16124126	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124127	Dissolved Metals, Dissolved Hg	16124128	Perchlorate	
BKGD-04	2016WB1-SW-BKGD-04	NR	NR	NR	3/22/2016	11:55	Surface Water	Field Sample	16124135	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124136	Dissolved Metals, Dissolved Hg	16124137	Perchlorate	
BKGD-05	2016WB1-SW-BKGD-05	NR	NR	NR	3/22/2016	11:00	Surface Water	Field Sample	16124132	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124133	Dissolved Metals, Dissolved Hg	16124134	Perchlorate	
BKGD-06	2016WB1-SW-BKGD-06	NR	NR	NR	3/17/2016	14:40	Surface Water	Field Sample	16114130	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114131	Dissolved Metals, Dissolved Hg	16114132	Perchlorate	
BKGD-07	2016WB1-SW-BKGD-07	NR	NR	NR	3/20/2016	12:45	Surface Water	Field Sample	16124106	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124107	Dissolved Metals, Dissolved Hg	16124108	Perchlorate	MS/MSD
BKGD-08	2016WB1-SW-BKGD-08	NR	NR	NR	3/20/2016	15:30	Surface Water	Field Sample	16124109	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124110	Dissolved Metals, Dissolved Hg	16124111	Perchlorate	
BKGD-09	2016WB1-SW-BKGD-09	NR	NR	NR	3/20/2016	14:40	Surface Water	Field Sample	16124112	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124113	Dissolved Metals, Dissolved Hg	16124114	Perchlorate	
BKGD-10	2016WB1-SW-BKGD-10	NR	NR	NR	3/21/2016	16:50	Surface Water	Field Sample	16124129	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124130	Dissolved Metals, Dissolved Hg	16124131	Perchlorate	
SP-02	2016WB1-SW-SP-02	NR	NR	NR	3/21/2016	13:25	Surface Water	Field Sample	16124116	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124117	Dissolved Metals, Dissolved Hg	16124118	Perchlorate	
SP-02	2016WB1-SW-SP-902	NR	NR	NR	3/21/2016	14:00	Surface Water	FD	16124119	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124120	Dissolved Metals, Dissolved Hg	16124121	Perchlorate	
SP-03	2016WB1-SW-SP-03	NR	NR	NR	3/20/2016	10:00	Surface Water	Field Sample	16124100	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124101	Dissolved Metals, Dissolved Hg	16124102	Perchlorate	
SP-03	2016WB1-SW-SP-903	NR	NR	NR	3/20/2016	10:30	Surface Water	FD	16124103	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16124104	Dissolved Metals, Dissolved Hg	16124105	Perchlorate	
SP-04	2016WB1-SW-SP-04	NR	NR	NR	3/19/2016	11:15	Surface Water	Field Sample	16114151	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114152	Dissolved Metals, Dissolved Hg	16114153	Perchlorate	
SP-05	2016WB1-SW-SP--05	NR	NR	NR	3/19/2016	16:35	Surface Water	Field Sample	16114160	Total Metals, Total Hg, Pest, SVOC + PAH SIM, TVOA + VOC SIM	16114162	Dissolved Metals, Dissolved Hg	16114160	Perchlorate	
FB-01	2016WB1-FB-01-03152016	NA	NA	NA	3/15/2016	20:00	Water	Filter Blank	--	--	16114106	Dissolved Metals, Dissolved Hg	--	--	
FB-02	2016WB1-FB-02-03152016	NA	NA	NA	3/15/2016	20:30	Water	Filter Blank	--	--	--	--	16114107	Perchlorate	
TB-01	TB-01	NA	NA	NA	3/15/2016	9:00	Water	Trip Blank	16114108	TVOA + VOC SIM					
TB-02	TB-02	NA	NA	NA	3/16/2016	9:00	Water	Trip Blank	16114133	TVOA + VOC SIM					
TB-03	TB-03	NA	NA	NA	3/17/2016	10:00	Water	Trip Blank	16114134	TVOA + VOC SIM					
TB-04	TB-04	NA	NA	NA	3/18/2016	9:00	Water	Trip Blank	16114144	TVOA + VOC SIM					
TB-05	TB-05	NA	NA	NA	3/19/2016	9:00	Water	Trip Blank	16114163	TVOA + VOC SIM					
TB-06	TB-06	NA	NA	NA	3/20/2016	9:00	Water	Trip Blank	16124115	TVOA + VOC SIM					
TB-07	TB-07	NA	NA	NA	3/21/2016	10:00	Water	Trip Blank	16124122	TVOA + VOC SIM					
TB-08	TB-08	NA	NA	NA	3/22/2016	10:00	Water	Trip Blank	16124138	TVOA + VOC SIM					

FD = Field duplicate
Hg = Mercury
NA = Not applicable (quality control sample)
NR = Not recorded (poor GPS reception)
PAH = Polycyclic aromatic hydrocarbons
Pest = Pesticides
SIM = Selected ion monitoring
SVOC = Semi-volatile organic compounds
TVOA = Total volatile organic analysis
um = Micron
VOC = Volatile organic compounds

Table 3-5

Event 1 Field Water Quality Measurements

Warmhouse Beach Dump Event 1 Field Data Report

Location	Location Type	Field Sample ID	Sample Date	Sample Time	Water Depth (feet)	Conductivity (mS/cm)	pH	Temp (°C)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Comment
SP-02	Seep	2016WB1-SW-SP-02	3/21/2016	13:25	0.8	0.21	6.19	10.04	--	133	5.1	
SP-03	Seep	2016WB1-SW-SP-03	3/20/2016	10:00	0.03	0.501	6.54	10.51	8.52	133	3.4	
SP-03D	Seep		3/20/2016	10:00		0.485	6.77	10.25	--	110	1.2	Duplicate field measurement
SP-04	Seep	2016WB1-SW-SP-04	3/19/2016	11:15		0.224	5.75	9.89	1.67	189	170	
SP-05	Seep	2016WB1-SW-SP--05	3/19/2016	16:35		0.253	6.31	9.81	4.54	173	5.9	
EC-01	SW	2016WB1-SW-EC-01	3/17/2016	15:45	0.5	0.316	6.78	8.66	5.21	194	0	
EC-02	SW	2016WB1-SW-EC-02	3/16/2016	12:30	0.3	0.259	6.41	8.24	10.04	225	4.52	
EC-03	SW	2016WB1-SW-EC-03	3/16/2016	11:15	0.3	0.261	6.1	8.39	10.15	242	4.48	
KC-01	SW	2016WB1-SW-KC-01	3/16/2016	15:15	0.55	0.054	6.08	7.74	10.72	224	2.54	
KC-02	SW	2016WB1-SW-KC-02	3/16/2016	16:00	0.3	0.054	5.99	7.77	10.74	241	2.06	
US-01	SW	2016WB1-SW-US-01	3/15/2016	15:40	0.004	0.121	6.7	8.61	10.15	NR	NR	
US-02	SW	2016WB1-SW-US-02	3/19/2016	15:00	0.2	0.247	6.6	10.02	5.58	160	3.6	
USB-01	SW	2016WB1-SW-USB-01	3/19/2016	15:00	0.1	0.118	7.16	9.57	8.71	134	4	
USB-01D	SW		3/19/2016	15:00		0.117	7.12	9.31	6.31	146	2.4	Duplicate field measurement
WC-01	SW	2016WB1-SW-WC-01	3/18/2016	16:00	0.4	0.367	6.83	9.39	10.51	100	31.6	
WC-02	SW	2016WB1-SW-WC-02	3/19/2016	10:10	0.3	0.306	6.34	9.32	6.69	172	0.6	
WC-03	SW	2016WB1-SW-WC-03	3/18/2016	13:30	0.5	0.293	6.7	8.96	5.02	193	4.4	
WC-04	SW	2016WB1-SW-WC-04	3/18/2016	12:30	5	0.275	6.39	8.35	7.49	204	1.9	
WC-05	SW	2016WB1-SW-WC-05	3/19/2016	12:30	0.5	0.228	6.77	9.03	5.83	150	3.8	
WC-06	SW	2016WB1-SW-WC-06	3/15/2016	14:30	0.075 -0.275	0.192	6.48	8.88	11.05	NR	NR	
BKGD-01	SW	2016WB1-SW-BKGD-01	3/15/2016	13:26	1	0.078	5.52	8.23	14.57	NR	NR	
BKGD-02	SW	2016WB1-SW-BKGD-02	3/21/2016	15:00	0.25	0.046	6.14	8.47	8.68	174	1.8	
BKGD-03	SW	2016WB1-SW-BKGD-03	3/21/2016	16:00	0.25	0.041	6.16	8.5	12.51	181	3.5	
BKGD-04	SW	2016WB1-SW-BKGD-04	3/22/2016	11:55	1	0.048	6.11	7.6	11.62	183	3	
BKGD-05	SW	2016WB1-SW-BKGD-05	3/22/2016	11:00	0.25	0.045	5.43	8.69	8.15	237	0.8	
BKGD-06	SW	2016WB1-SW-BKGD-06	3/17/2016	14:40	0.75	0.047	5.73	7.54	10.44	220	0	
BKGD-07	SW	2016WB1-SW-BKGD-07	3/20/2016	12:45	0.6	0.059	6.49	8.3	3.72	137	9.5	
BKGD-08	SW	2016WB1-SW-BKGD-08	3/20/2016	15:30	0.4	0.057	5.58	7.86	--	96	31.5	
BKGD-09	SW	2016WB1-SW-BKGD-09	3/20/2016	14:40	0.25	0.045	5.87	8.42	3.52	167	27.6	
BKGD-10	SW	2016WB1-SW-BKGD-10	3/21/2016	16:50	0.3	0.058	5.95	8.18	2.04	192	7.7	

mS/cm = millisiemens per centimeter

°C = degree celcius

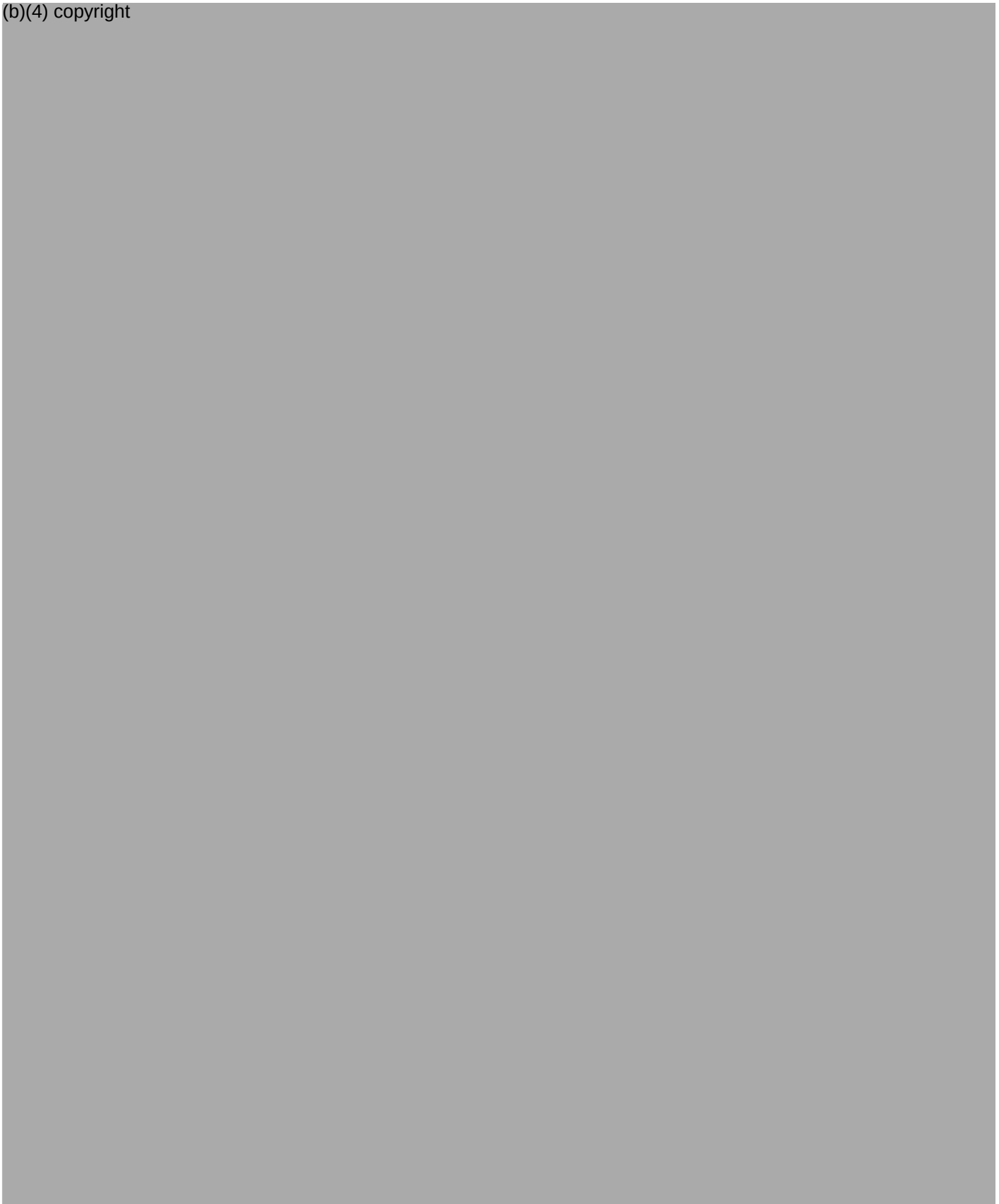
mg/L = milligrams per liter

mV = millivolts

NTU = nephelometric turbidity units

Figures

(b)(4) copyright



ecology and environment, inc. Global Specialists in the Environment Seattle, Washington	MAKAH RESERVATION WARMHOUSE BEACH DUMP SITE Neah Bay, Washington	Figure 1 1 SITE VICINITY MAP		
	0 1,333 2,666 Approximate Scale in Feet	Date: 7 14 11	Drawn by: AES	10:START 3\11010013\fig 1 2

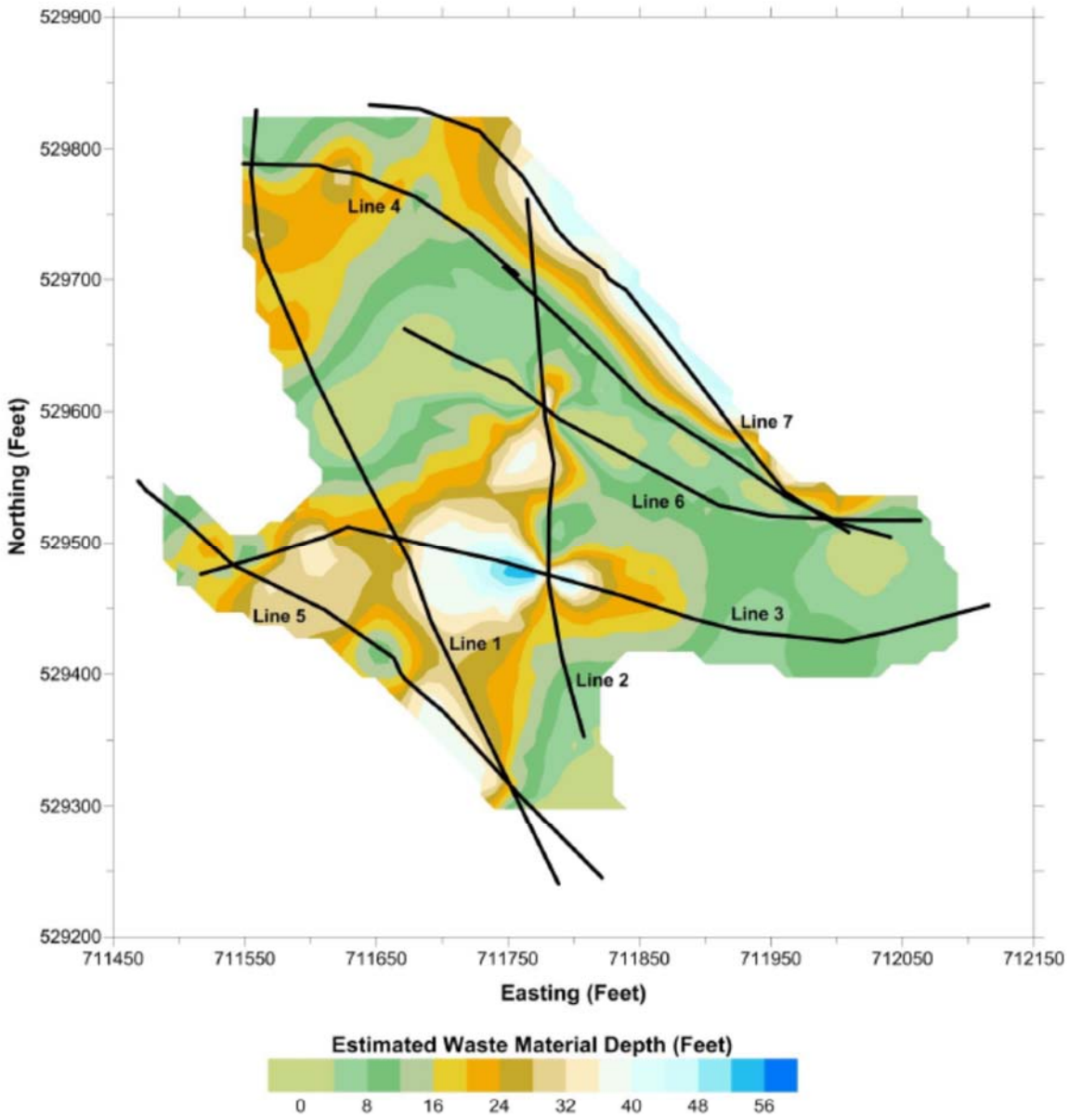
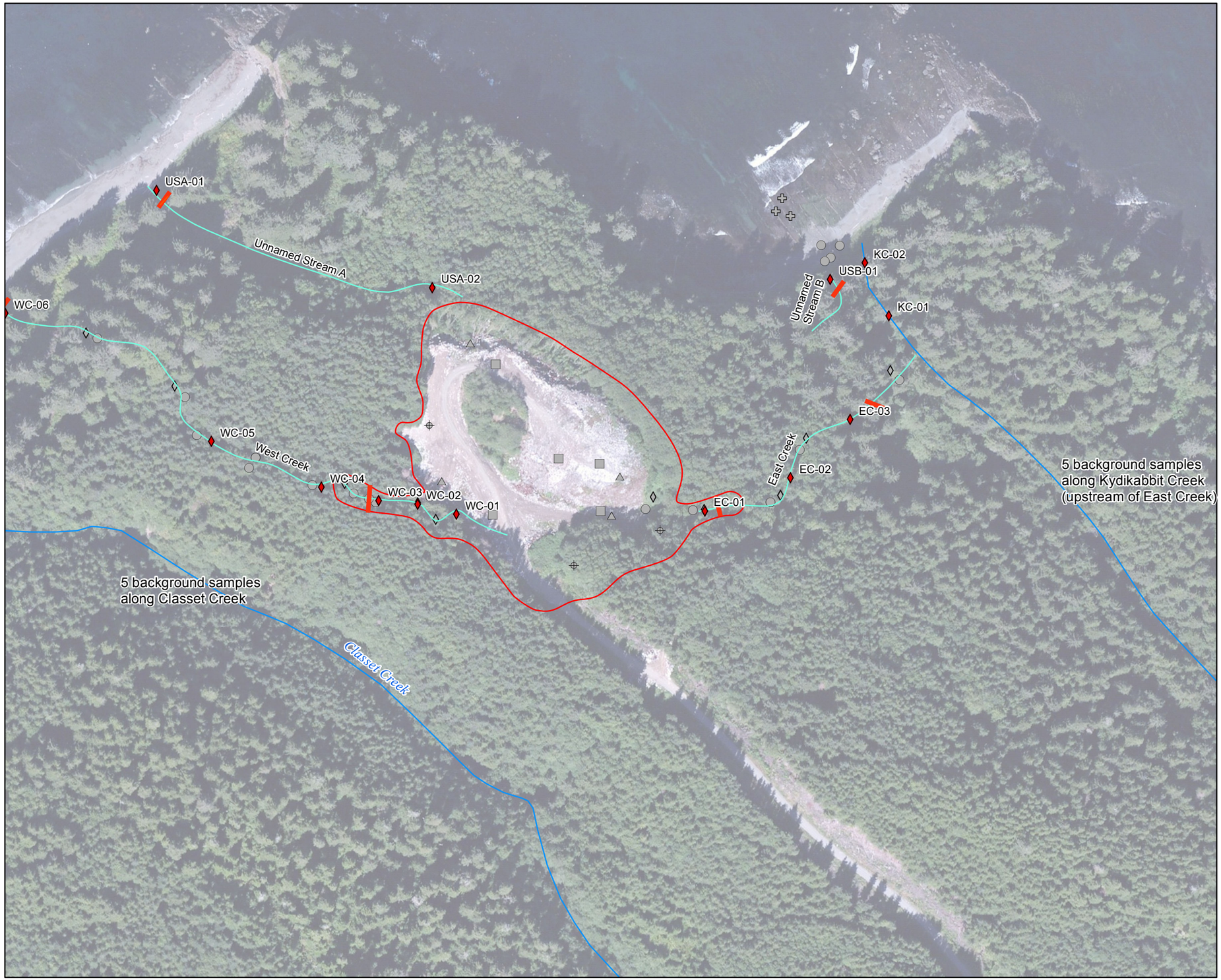


Figure 3-1

Estimated Waste Material Depths across the Warmhouse Beach Dump Site based on the Interpreted Interface in the Model Resistivity Results
Warmhouse Beach Dump Site
Neah Bay, Washington



VICINITY MAP

LEGEND

Previous Sample Locations

- Monitoring Well
- Surface Water Sample
- Sediment Sample
- Soil/Waste SPLP Sample
- Surface Soil/Waste Sample
- Musssel Tissue Sample
- Makah Streams
- Approximate Extent of Dump
- Surface Water Sample Location
- Gaging Transect

Notes:
1. Area of interest subject to change.

N

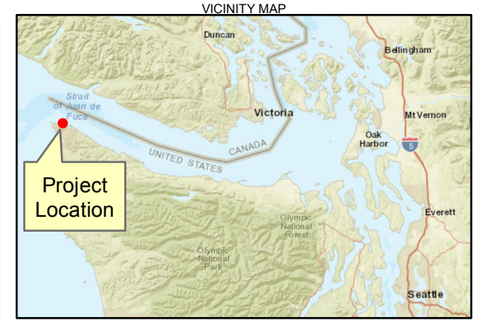
0 300 600
Feet

FIGURE 3-2
Event 1 Stream Gaging Transects and Surface Water Sample Locations
Warmhouse Beach Dump Site
Neah Bay, Washington

C:\Users\mgauthie\Desktop\Warmhouse Beach\map_files\Basemap_ProposedSW.mxd 5/4/2016 mgauthie

CH2MHILL

VICINITY MAP



LEGEND

Previous Sample Locations
- Monitoring Well
- Surface Water Sample
- Sediment Sample
- Soil/Waste SPLP Sample
- Surface Soil/Waste Sample
- Musssel Tissue Sample
- Makah Streams
- Approximate Extent of Dump

Proposed Seep Survey Area
- East Creek Focus Area
- General Seep Survey Area
- West Creek Focus Area
- Seep observed during Event 1

Notes:
1. Area of interest subject to change.
2. Two seep survey events are planned, one in dry season and one in wet season.

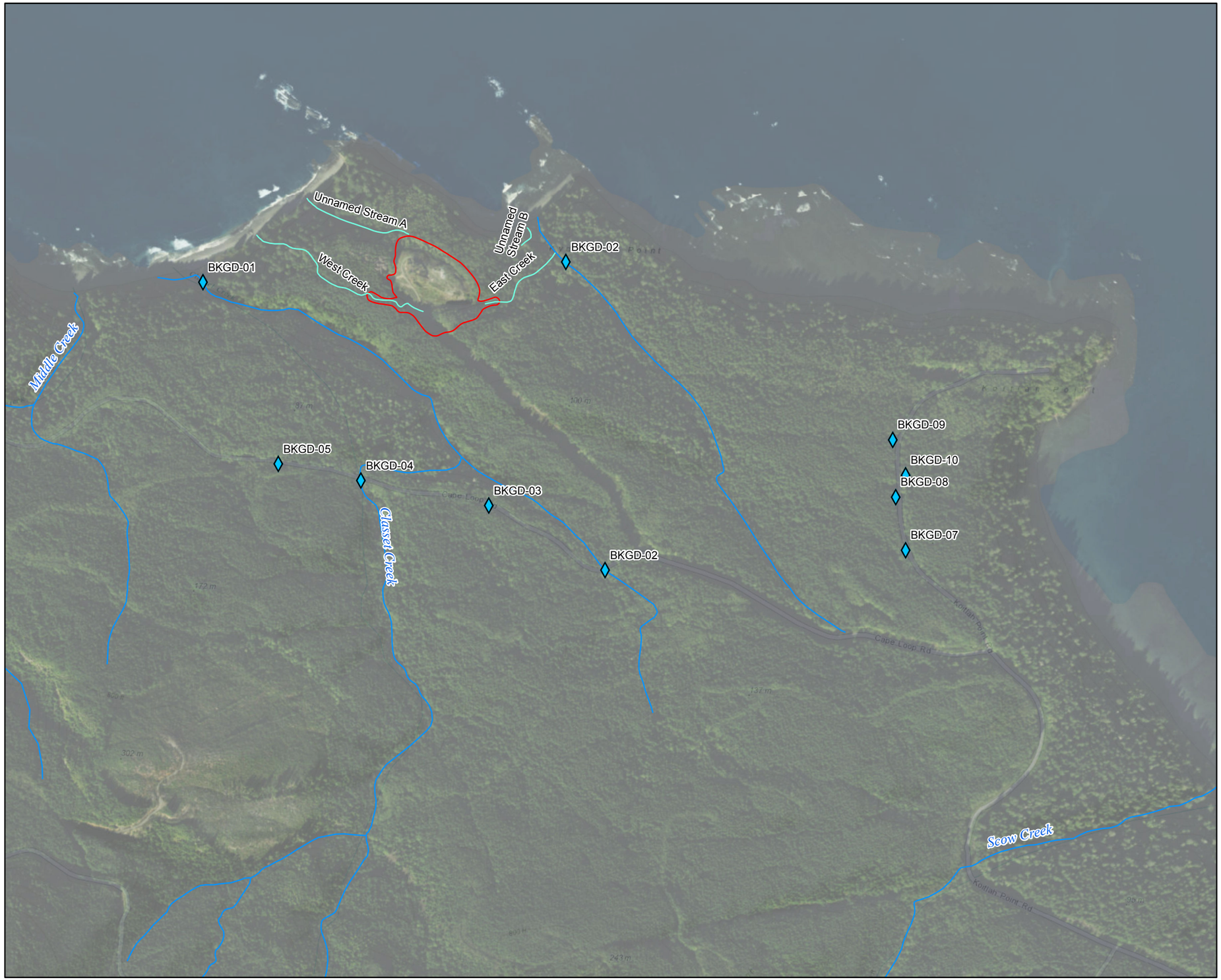
N

0 300
Feet

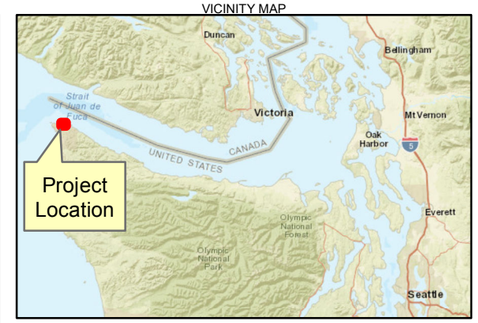
FIGURE 3-3
Event 1 Seep Survey Area and Seep Locations
Warmhouse Beach Dump Site
Neah Bay, Washington

CH2MHILL

C:\Users\mgauthie\Desktop\Warmhouse Beach\map_files\Basemap_Proposed_Seep.mxd 5/4/2016 mgauthie



VICINITY MAP



LEGEND

- Makah Streams
- Approximate Extent of Dump
- Event 1 Background Surface Water Sample Location

Notes:
1. Area of interest subject to change.

N

0 300 600
Feet

FIGURE 3-4
Event 1 Background Surface Water Sample Locations
Warmhouse Beach Dump Site
Neah Bay, Washington

C:\Users\mgauthie\Desktop\Warmhouse Beach\RI_FS_QAPP\Event 2 QAPP\Background SW.mxd 6/14/2016 mgauthie

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Appendix A
Topographic Map

TOPOGRAPHIC SURVEY

SEC. 15, T. 33 N., R. 04 W., W.M.
CLALLAM COUNTY, WASHINGTON

N

GRAPHIC SCALE

0 15 30 60

(IN FEET)
1 inch = 30 ft.
CONTOUR INTERVAL = 1 FOOT

LEGEND:

- SET 5/8" REBAR AND CAP STAMPED "PGS INC"
- MW MONITORING WELL
- BOLLARD

VERTICAL DATUM:

THE VERTICAL DATUM FOR THIS SURVEY IS NAVD 88, BASED ON PUBLISHED ELEVATIONS WSDOT MONUMENTS:

'MAKAH' MONUMENT ID 6257
ELEVATION: 137.050 FEET

'SP 28-1' MONUMENT ID 6278
ELEVATION: 21.670 FEET

HORIZONTAL DATUM:

THE HORIZONTAL DATUM FOR THIS SURVEY IS NAD 83/11, BASED ON PUBLISHED COORDINATES FOR WSDOT MONUMENTS:

'MAKAH' MONUMENT ID 6257
NORTHING: 518686.797 FEET
EASTING: 734392.130 FEET

'SP 28-1' MONUMENT ID 6278
NORTHING: 501435.204 FEET
EASTING: 709471.150 FEET

STATISTICS:

EQUIPMENT: TRIMBLE VX ROBOTIC TOTAL STATION & R10 GPS.
METHODOLOGY: FIELD TRAVERSE AND NETWORK RTK.
MEETS OR EXCEEDS SURVEY STANDARD AS PER:
WAC 332-130-050
WAC 332-130-090
WAC 332-130-100
ALL SURVEY WORK OCCURRED IN MARCH OF 2016.

SURVEYORS NOTES:

1. MINIMAL SURVEY DATA WAS COLLECTED ON SLOPES WHICH WERE TOO STEEP TO CLIMB, AS COORDINATED WITH THE SITE MANAGER IN THE FIELD. ALTERNATIVELY, THE TOPS AND TOES OF THE SLOPES WERE MAPPED WHERE THE SLOPE WAS DETERMINED TO BE OF CONSISTENT GRADE.

CHECKED BY: JNM
DRAWN BY: KAM
DRAWING NAME: 1600901_C3D_TOP.dwg
SCALE: 1" = 30'
DATE: 03/29/2016
SHEET: 1 OF 1
JOB NUMBER: 16-009-01

SHEET TITLE: TOPOGRAPHIC SURVEY NEAH BAY, WASHINGTON

CLIENT: CH2M HILL BELLEVUE, WASHINGTON

REVISIONS

REV.	DESCRIPTION	BY	DATE

PACIFIC GEOMATIC SERVICES, INC.
LAND SURVEYING & MAPPING SERVICES
QUALITY SERVICE - CREATIVE SOLUTIONS
6608 216TH STREET SW, STE 304
MOUNTLAKE TERRACE, WA 98043
PHONE: (425) 775-6560 FAX: (425) 775-2849
WEB: www.PacGeoInc.com
PGS / INC

Appendix B
Geophysical Survey Report

RPT-2015-039

GEOPHYSICAL SURVEY OF THE WARMHOUSE BEACH DUMP – NEAH BAY, WA

N. Crook, Ph.D.
M. Levitt

hydroGEOPHYSICS
2302 N. Forbes Blvd, Tucson, AZ 85745 USA

Date Published
April 2016

Prepared for CH2M

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

This report documents the results of a geophysical survey conducted at the Warmhouse Beach Dump Site on the Olympic Peninsula near Neah Bay, WA, in March, 2016, under contract to CH2M by hydroGEOPHYSICS, Inc. (HGI). CH2M is under contract to the US EPA to investigate the best course of action for closure of the Warmhouse Beach Dump site. One activity related to the closure is an updated estimate of the depth and lateral limits of the waste across the dump site to allow a determination of the volume of wastes. The geophysical survey consisted of electrical resistivity surveying, and was conducted along a total of seven survey lines to determine the presence of any underlying void spaces.

The Warmhouse Beach Dump was initially used by the US Air Force and Navy in the 1940s for disposal of solid waste, including household and hazardous wastes. Disposal activities continued until 1988, with Department of Defense records indicating that the Warmhouse Beach Dump was more actively used by the US Air Force and Navy after the Koitlah Point Dump was closed in the mid-to-late 1960s. The Makah Tribe continued to use the Warmhouse Beach Dump after this date for municipal solid waste until the dump was closed in 2012 (Ridolfi, 2003).

Initially, waste materials were dumped into a ravine that runs east to west through the site. As the ravine was filled in with waste material, a road was constructed over the top of the waste material and across the ravine. Waste materials were then dumped on the ridge top, burned to a limited extent, and pushed down the south slope of the ridge toward to ravine (Ridolfi, 2003).

1.2 SITE LOCATION

The Warmhouse Beach Dump Site is located 2 to 3 miles northwest of Neah Bay in Clallam County, WA, and is situated on a ridge line overlooking the Strait of Juan de Fuca. The oval shaped dump occupies approximately 7 acres in a ravine at the top of the ridge. The dump is bordered by forests and is approximately 800 feet inland from the Strait of Juan de Fuca shoreline, at an elevation of approximately 200 feet above mean seal level (amsl). Figure 1 shows the location of the Warmhouse Beach Dump Site geophysical survey area; the electrical resistivity survey lines are overlaid onto the satellite image in Figure 2.

The Warmhouse Beach Dump site is located on top of siltstones of the Hoko River Formation, primarily consisting of siltstone and pebble-cobble conglomerates, with thin, fine to medium grained sandstone beds. This formation dips to the northwest at approximately 30 degrees, and is estimated to be at least 2000 feet thick beneath the site. On-site soils are primarily sandy silts

with a high percentage of orgaincs from the adjacent forest area. These soils overlay a hard grey siltstone. Silty soils developed on the Hoko Formation are often found as slope-wash over cliff and cut faces, and are generally less than four to five feet thick. The conglomerate is predominantly well cemented, and so is unweathered with no soil layer (Ridolfi, 2003).

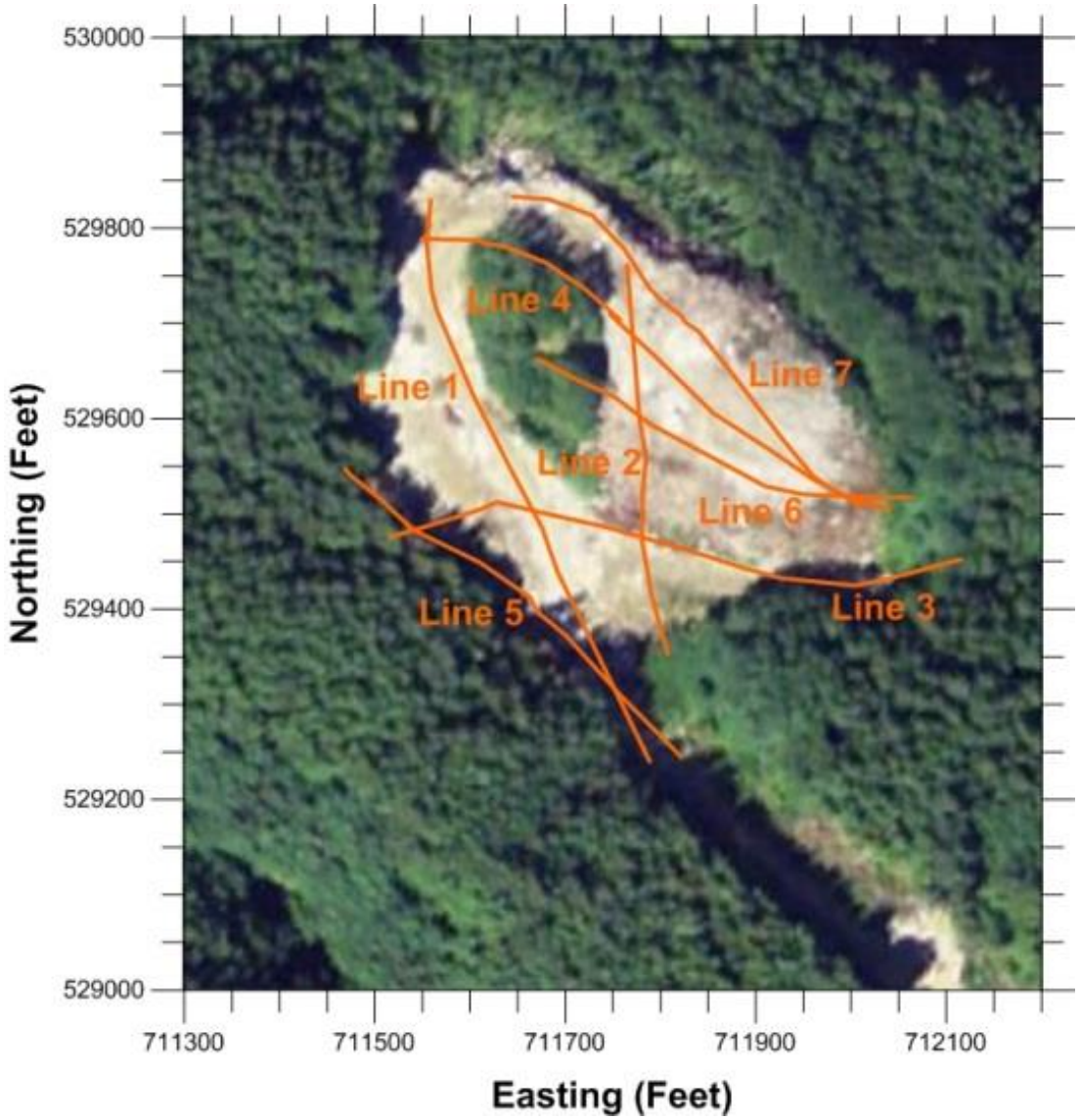
1.3 OBJECTIVE OF INVESTIGATION

The objective of the geophysical investigation is to evaluate the depth and lateral limits of the waste materials across the Warmhouse Beach Dump site to allow a determination of the volume of waste.

The geophysical method was selected to take advantage of physical property contrasts that are reflective of site conditions. For example, it was expected that the waste materials would present a significant contrast in electrical resistivity compared to the background marine geological bedrock. Previous experience at landfill sites tends to indicate that the waste materials associated with these sites are electrically conductive compared to the background geology or fill materials.

Figure 1. General Location Map of the Warmhouse Beach Dump - Geophysical Survey Area.

Figure 2. General Site Map with Electrical Resistivity Survey Lines.

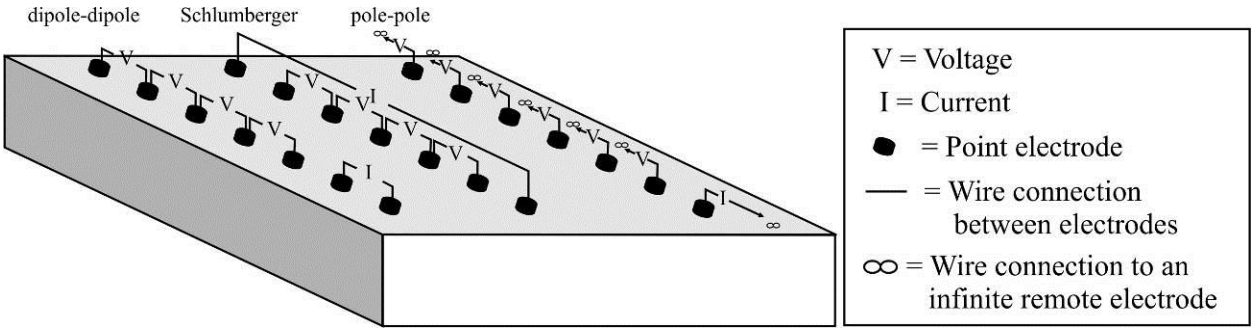


2.0 GEOPHYSICAL THEORY - ELECTRICAL RESISTIVITY

Electrical resistivity is a volumetric property that describes the resistance of electrical current flow within a medium (Rucker et al., 2011; Telford et al., 1990). Direct electrical current is propagated in rocks and minerals by electronic or electrolytic means. Electronic conduction occurs in minerals where free electrons are available, such as the electrical current flow through metal. Electrolytic conduction, on the other hand, relies on the dissociation of ionic species within a pore space and is more common in the partially saturated sandy alluvium and fractured bedrock. With electrolytic conduction, the movement of electrons varies with the mobility, concentration, and the degree of dissociation of the ions. Competent rock free of fissures and fractures will have a higher resistivity compared to less competent rock.

Mechanistically, the resistivity method uses electric current (I) that is transmitted into the earth through one pair of electrodes (transmitting dipole) that are in contact with the soil. The resultant voltage potential (V) is then measured across another pair of electrodes (receiving dipole). Numerous electrodes can be deployed along a transect (which may be anywhere from feet to miles in length), or within a grid. Figure 3 shows examples of electrode layouts for surveying. The figure shows transects with a variety of array types (dipole-dipole, Schlumberger, pole-pole). A complete set of measurements occurs when each electrode (or adjacent electrode pair) passes current, while all other adjacent electrode pairs are utilized for voltage measurements. Modern equipment automatically switches the transmitting and receiving electrode pairs through a single multi-core cable connection. Rucker et al. (2009) describe in more detail the methodology for efficiently conducting an electrical resistivity survey.

Figure 3. Possible Arrays for use in Electrical Resistivity Characterization



The modern application of the resistivity method uses numerical modeling and inversion theory to estimate the electrical resistivity distribution of the subsurface given the known quantities of electrical current, measured voltage, and electrode positions. A common resistivity inverse method incorporated in commercially available codes is the regularized least squares optimization method (Sasaki, 1989; Loke, et al., 2003). The objective function within the

optimization aims to minimize the difference between measured and modeled potentials (subject to certain constraints, such as the type and degree of spatial smoothing or regularization) and the optimization is conducted iteratively due to the nonlinear nature of the model that describes the potential distribution. The relationship between the subsurface resistivity (ρ) and the measured voltage is given by the following equation (from Dey and Morrison, 1979):

$$-\nabla\cdot\left[\frac{1}{\rho(x,y,z)}\nabla V(x,y,z)\right]=\left(\frac{I}{U}\right)\delta(x-x_s)\delta(y-y_s)\delta(z-z_s) \quad (1)$$

where I is the current applied over an elemental volume U specified at a point (x_s, y_s, z_s) by the Dirac delta function.

Equation (1) is solved many times over the volume of the earth by iteratively updating the resistivity model values using either the L_2-norm smoothness-constrained least squares method, which aims to minimize the square of the misfit between the measured and modeled data (de Groot-Hedlin & Constable, 1990; Ellis & Oldenburg, 1994):

$$\left(J_i^T J_i+\lambda_i W^T W\right)\Delta r_i = J_i^T g_i - \lambda_i W^T W r_{i-1} \quad (2)$$

or the L_1-norm that minimizes the sum of the absolute value of the misfit:

$$\left(J_i^T R_d J_i+\lambda_i W^T R_m W\right)\Delta r_i = J_i^T R_d g_i - \lambda_i W^T R_m W r_{i-1} \quad (3)$$

where g is the data misfit vector containing the difference between the measured and modeled data, J is the Jacobian matrix of partial derivatives, W is a roughness filter, R_d and R_m are the weighting matrices to equate model misfit and model roughness, Δr_i is the change in model parameters for the i^{th} iteration, r_i is the model parameters for the previous iteration, and λ_i = the damping factor.

3.0 METHODOLOGY

3.1 SURVEY AREA AND LOGISTICS

A geophysical survey, consisting of electrical resistivity, was completed at the Warmhouse Beach Dump Site - Neah Bay, WA, between the 15th and 17th of March, 2016. The geophysical survey consisted of seven survey lines of electrical resistivity varying in length between 450 and 670 feet. The site has significant topography and therefore survey line location was selected in an effort to minimize extreme topographic changes along the survey lines. Figure 2 shows a detailed line layout for the geophysical surveying.

3.2 EQUIPMENT

3.2.1 Equipment for Electrical Resistivity Surveying

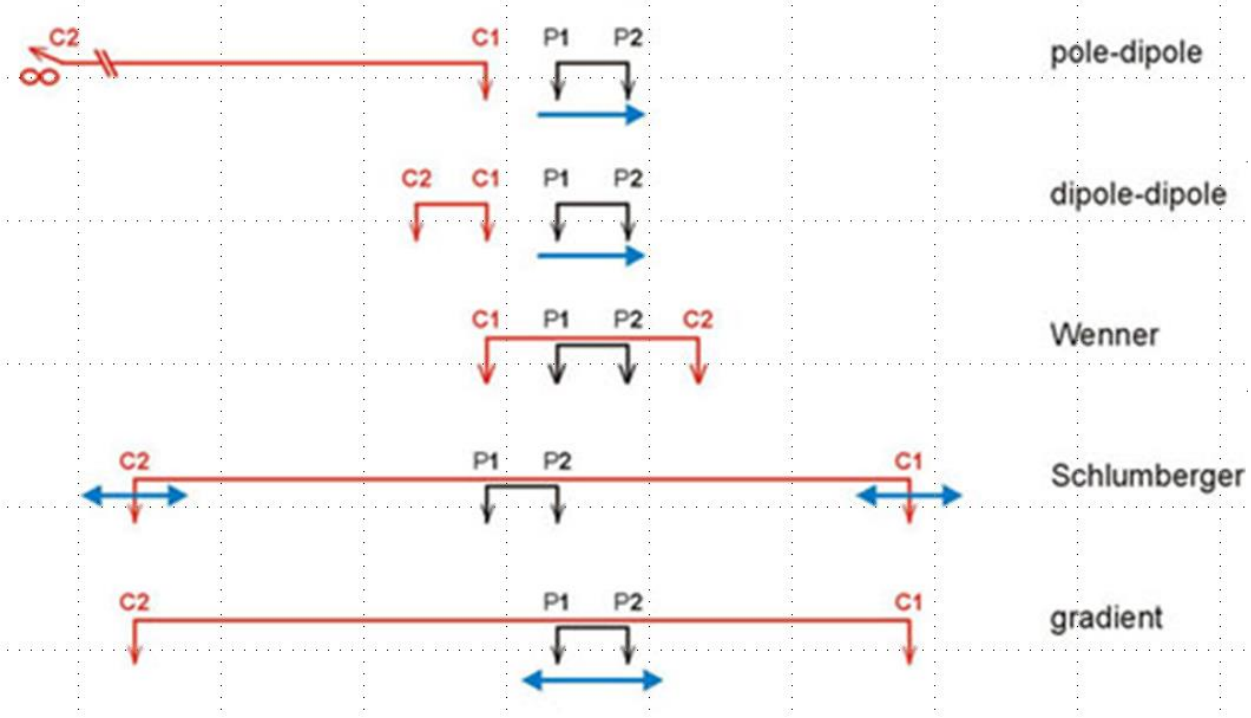
Data were collected using a Supersting™ R8 multichannel electrical resistivity system (Advanced Geosciences, Inc. (AGI), Texas) and associated cables, electrodes, and battery power supply. The Supersting™ R8 meter is commonly used in surface geophysical projects and has proven itself to be reliable for long-term, continuous acquisition. The stainless steel electrodes were laid out along lines with a constant electrode spacing of ~3 feet (1 meter). Multi-electrode systems allow for automatic switching through preprogrammed combinations of four electrode measurements.

We tested a number of electrode configurations during the initial startup phase of the survey; including the Schlumberger and modified Wenner electrode configurations (Figure 3 and 4). The electrode configurations are simply different geometries between the injection current electrodes and voltage measurement electrodes, which provides different sensitivities, and resolution depending on the survey targets, environment, etc. For further details on the electrode configuration, see Binley and Kemna (2005). In general, the Schlumberger electrode configuration provides improved near-surface resolution compared to the other configurations and the modified Wenner electrode configuration typically provides an improved signal to noise ratio. The results of the electrode configuration testing found the modified Wenner electrode configuration provided a significant improvement in the data quality. This improvement was observed during both the raw data editing and inversion modeling, when compared to the Schlumberger electrode configuration. Based on the favorable test results, it was decided to proceed with the modified Wenner electrode configuration for the remaining sites in the survey.

Electrode locations were determined based on the distance along the cable length. A number of electrode locations were marked by pin flags, which were then surveyed using a total station survey provided by Pacific Geomatic Services, Inc. The pin flagged electrode locations were

chosen to capture any significant changes in topography along the resistivity lines for inclusion in the inversion modeling.

Figure 4. Example electrode configurations for electrical resistivity surveys; the Wenner and Schlumberger were tested for this survey.



3.3 DATA PROCESSING

3.3.1 Quality Control – Onsite

Electrical resistivity data were given a preliminary assessment for quality control (QC) in the field to assure quality of data before progressing the survey. Following onsite QC, the data were transferred to the HGI server for storage and detailed data processing and analysis.

3.3.2 Resistivity Data Editing

The geophysical data for the resistivity survey, including measured voltage, current, measurement (repeat) error, and electrode position, were recorded digitally with the AGI SuperSting R8 resistivity meter. Each line of acquisition was recorded with a separate file name. Following field data collection, the raw resistivity data files were transmitted to the HGI server located in Tucson, Arizona. Data quality was inspected and checked for consistency with respect to adjacent line results, then data files were saved to designated folders on the server.

The raw data were evaluated for measurement noise. Those data that appeared to be extremely noisy and fell outside the normal range of accepted conditions were removed. Examples of conditions that would cause data to be removed include: negative or very low voltages, high-calculated apparent resistivity, extremely low current, and high repeat measurement error.

3.3.3 2D Resistivity Inversion

RES2DINVx64 software (Geotomo, Inc.) was used for inverting individual lines in two dimensions. RES2DINVx64 is a commercial resistivity inversion software package available to the public from www.geoelectrical.com. An input file was created from the edited resistivity data and inversion parameters were chosen to maximize the likelihood of convergence. It is important to note that up to this point, no resistivity data values had been manipulated or changed, such as smoothing routines or box filters. Noisy data had only been removed from the general population.

The inversion process followed a set of stages that utilized consistent inversion parameters to maintain consistency between each model. Inversion parameter choices included the starting model, the inversion routine (robust or smooth), the constraint defining the value of smoothing and various routine halting criteria that automatically determined when an inversion was complete. Convergence of the inversion was judged whether the model achieved an RMS of less than 8% within five iterations. The extreme topography changes and poor electrical contact, due the waste materials at the surface, along some of the lines contributed to the high RMS errors, above the typical 5% we might expect.

3.3.4 2D Resistivity Plotting

The inverted data were output from RES2DINVx64 into an .XYZ data file and were then gridded and color contoured in Surfer (Golden Software, Inc.). Electrode locations and other relevant line features were plotted on the resistivity sections to assist in data analysis. Qualified in-house inversion experts subjected each profile to a final review.

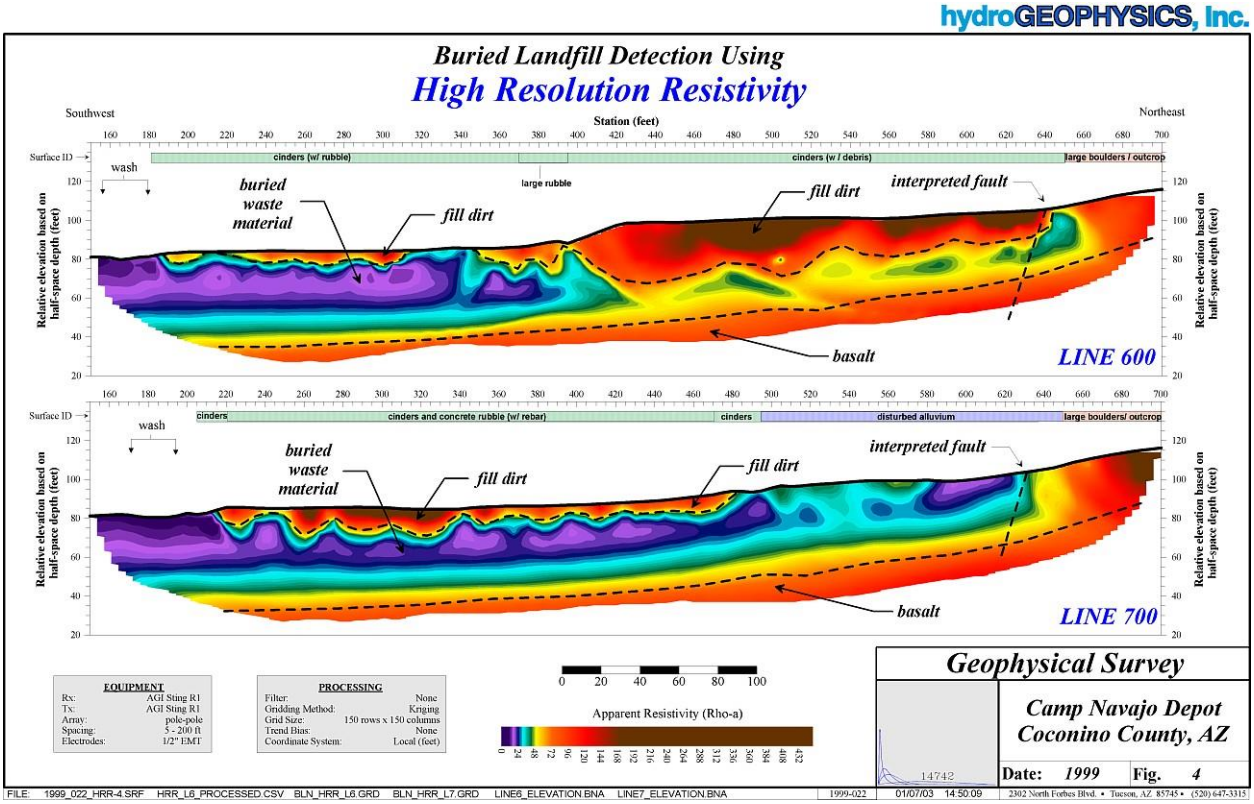
4.0 RESULTS & INTERPRETATION

The inverse model results for the electrical resistivity survey lines are presented as two-dimensional (2D) profiles in Figures 7 through 20. Common color contouring scales are used for all of the lines to highlight regions associated with the waste and provide the ability to compare intensity of targets from line to line. Electrically conductive (low resistivity) subsurface regions are represented by cool hues (pinks to blues) and electrically resistive regions are represented by warm hues (yellow to brown). To help emphasize particular features in each section a log scale of model resistivity is used in the profile figures. When data span multiple orders of magnitude, it is appropriate to display a log transformation. Other notes of interest about the site, either observed by or relayed to HGI, are also annotated on the profiles.

The objective of the survey was to geophysically characterize the Warmhouse Beach Dump and identify the lateral limits and depth of the waste within this area. Previous experience at landfill sites tends to indicate that the waste materials associated with these sites are electrically conductive compared to the background geology or fill materials. The example in Figure 5 displays the results from a landfill characterization project in Arizona, where two electrical resistivity cross-sections were collected across the non-operational landfill. The site had been abandoned and the spatial extent of the landfill was unknown due to a cover placed over the solid waste. An initial magnetic survey provided the spatial limits of the waste material in the landfill and this was followed up by a series of electrical resistivity transects to confirm these findings and determine the depth of the wastes. The buried solid waste material clearly shows up as the conductive features (purple to blue hues) compared to the resistive native bedrock and cover materials (orange to brown hues). This is expected since as the waste materials break down and decompose the resulting decomposition products and leachates can be highly electrically conductive compared to the original wastes. In addition, the majority landfills are lined in some way, either with a synthetic liner or by using a clay layer at the base, and so can concentrate these leachates within the landfill area.

The results from the Warmhouse Beach Dump would tend to indicate that in this case the wastes are predominantly electrically resistive compared to the background and underlying geological materials (Figures 7 through 20). This is an unlined landfill/dump, with the waste being placed/dumped directly on top of the underlying bedrock. Therefore, any decomposition products and leachate, which are typically highly electrically conductive, may have been flushed into the surrounding creeks and watersheds over the years based on the high rainfall totals for the area. In addition, the underlying geology is predominantly marine siltstones and conglomerates that are electrically conductive based on their grain size and depositional environments.

Figure 5. Example electrical resistivity survey results from a previous landfill characterization project in Arizona.



There are a number of variations to the above relationship across the site, for example more electrically conductive areas, potentially relating to high concentrations of metallic wastes, and more resistive bedrock regions, potentially relating to the coarser grained marine conglomerate units. This complicates the relationship between resistivity value and waste versus natural geological material between the various electrical resistivity lines and so a uniform cut-off resistivity value may not be relevant across the site.

4.1 LINE 1

Figure 7 displays the modeled resistivity results for Line 1, for the modified Wenner electrode configuration, which runs in a south to north direction. The model results display a two layer structure; with a resistive discontinuous near-surface layer, which varies in thickness and potentially represents the waste material. This overlies a more conductive layer, which extends to the depth limits of the model, and likely represents the underlying marine siltstone bedrock material.

Line 1 started on the access road to dump and was estimated to be beyond the southern limit of the waste, and so on underlain by natural geological material. Between 0 and 60 feet along the line the model indicates a conductive subsurface, likely representing the underlying marine

siltstone bedrock material. At approximately 60 feet along the line an abrupt change to more resistive material is observed in the near surface. This near-surface layer, located between approximately 60 and 375 feet along the line, increases to a maximum thickness of approximately 35 feet at approximately 260 feet along the line, before appearing to pinch out again at 375 feet along the line. Initial activity at the site involved dumping waste into the ravine, marked on the line between approximately 225 and 275 feet. Therefore, it is likely this resistive region is a response to the waste materials, since the maximum thickness corresponds to section of the line over the ravine area. The resistivity value associated with this abrupt change is difficult to isolate without having any additional information on the thickness of the waste materials from wells or boreholes that could be used to calibrate geophysical results. Therefore, we are reliant on obtaining an informed resistivity value associated with transition from geological bedrock material to the dumped waste materials form the model results alone. Based on the contrasting electrical properties of the materials, we would anticipate high gradients in the resistivity values at the interface between the two, assuming a sharp boundary. From visual inspection, resistivity values greater than approximately 55 Ωm (Log_{10} resistivity value 1.75) appear associated with dumped waste materials.

Between approximately 375 and 415 feet along the line, the resistivity values in the near surface appear to return to those associated with the marine siltstone bedrock material, potentially indicating no significant waste material is present.

Between approximately 415 and 620 (the northern limit of the resistivity model) feet along the line a variable near-surface layer is observed. An abrupt change to more resistive material is observed at approximately 415 feet along the line, this transitions to a highly conductive region between approximately 450 and 525, before becoming highly resistive towards the end of the line. While the resistive regions are likely a response to the waste material as observed for the previously described near-surface region, the conductive regions of the model results have been previously assigned as bedrock responses. However, the resistivity values of this conductive near—surface region are of a much higher conductivity than the general average for the interpreted marine siltstone bedrock responses. In addition, the shape and character of the transition is too sharp for geology alone. The pink hues are associated with resistivity values <10 Ωm (<Log_{10} resistivity value 1.0) and are potentially responses from regions associated with metallic wastes or where leachate from decomposing waste materials may be concentrated. From this interpretation the waste material appears to be increasing in thickness towards the end of the line, with this near-surface layer approximately 30 feet in thickness at the northern limit of the model. Line 1 ends at the edge of the steep slope on the northern limit of the dump where waste material has appeared to be pushed over the edge of the slope during disposal activities.

Applying these relationships to the model resistivity results enables us to highlight areas that are potentially a response to the waste materials dumped at the site (Figure 8).

4.2 LINE 2

Figure 9 displays the modeled resistivity results for Line 2, for the modified Wenner electrode configuration, which runs in a south to north direction. Line 2 ran from the vicinity of monitoring well MW-02, across the ravine area, up the very steep slope to the ridge on top of the dump area, and a short distance down the slope on the northern limit of the dump area. The model results display a two-layer structure; with a resistive discontinuous near-surface layer, which varies in thickness and potentially represents the waste material. This overlies a more conductive layer, which extends to the depth limits of the models in the majority of areas, and likely represents the underlying bedrock material.

Line 2 started in the heavily vegetated area to the east of the access road and was estimated to be beyond the southern limit of the waste and so on underlain by natural geology material. Unfortunately, there was no way to avoid the extreme topography and still image across the dump area. For this survey line, the topography created problems with the inversion model and even resulted in areas of omitted results, for example between 0 and 35 feet along the line. Between approximately 35 and 125 feet along the line a resistive near-surface layer is observed, which is potentially a response to the waste materials. The highly conductive region observed between approximately 85 and 120 feet along the line, and between a depth of approximately 10 and 20 feet below ground surface (bgs), is potentially a response to metallic wastes or where leachate from decomposing waste materials may be concentrated based on the resistivity values. It is likely that the return to resistive values in the area below this conductive region is an artefact of the inversion model due to the proximity of the bottom limit of the model.

The near-surface resistive layer returns at approximately 150 feet along the line and extends to the northern limit of the model. This layer appears to thicken between approximately 150 and 230 feet along the line, towards the base of the steep slope, increasing from approximately 5 to 25 feet in thickness. The steep slope and the base area at the bottom, appear to be where trash was dumped from the top, cascading down the slope and piling at the bottom and support the resistivity model showing a thicker resistive layer in this area. Another highly conductive region is observed between approximately 185 and 215 feet along the line, extending from the ground surface to a depth of approximately 7 feet (bgs). This again is potentially a response to metallic wastes or where leachate from decomposing waste materials may be concentrated, based on the resistivity values. The thickness of the near-surface layer appears constant up the steep slope, with interpreted waste materials extending to a depth of approximately 25 feet (bgs). The layer appears to thin once on the ridge on top of the dump area, between approximately 305 and 340 feet along the line, with an average thickness of approximately 5 feet. A number of bedrock outcrops are observed in this area of the dump, which would correlate well with thinning of the waste material in the resistivity profile. Between approximately 340 and 495 feet along the line,

the near-surface resistive layer thickens significantly, ranging between approximately 15 and 28 feet in thickness.

The underlying conductive region displays similar resistivity ranges to those observed in Line 1 between approximately 0 and 300 feet along the line, suggesting this is a response to the marine siltstone bedrock material in this region. As we advance further to the north we observe a resistive feature at depth, located between approximately 330 and 400 feet along the line and extending from a depth of approximately 35 feet (bgs) to the depth limit of the model (approximately 55 feet in this location). Based on the location, beneath visible bedrock outcrops on ground surface, and the depth of this feature it is unlikely to be a response to waste material. It is potentially a response to a change in the lithology at depth, a variation in the conglomerate composition perhaps. Sandwiched between this resistive feature and the interpreted waste material near-surface layer above, the model displays a conductive region. The average resistivity value of this region is higher than that associated with the siltstone bedrock material to the south. This may be a modeling artifact response due to the highly resistive regions above and below. Alternatively, this may reflect a higher resistivity associated with the marine conglomerate bedrock material observed in outcrops in this area on the top of the dump.

In a similar manner to the previous line, we can apply these relationships to the model resistivity results enables us to highlight areas that are potentially a response to the waste materials dumped at the site (Figure 10).

4.3 LINE 3

Figure 11 displays the modeled resistivity results for Line 3, for the modified Wenner electrode configuration, which runs in a west to east direction. Line 3 ran from the top of the bank above the west creek, across the access road to the dump, along the base of the very steep slope to the ridge on top of the dump area, and ended to the east of monitoring well MW-03. The model results display a two layer structure; with a resistive fairly continuous near-surface layer, which varies in thickness and potentially represents the waste material. This overlies a more conductive layer, which extends to the depth limits of the model, and likely represents the underlying marine siltstone bedrock material.

Line 3 started on top of the steep bank sloping down to the west creek, with waste material evident in the bank slope. Between approximately 25 and 305 feet along the line, a resistive near-surface layer is observed, which averages approximately 35 feet in thickness. This layer is potentially a response to the waste materials dumped in this area. A number of highly conductive regions are observed within this layer, with two located at the surface between 70 and 90 feet and 220 and 270 feet along the line. These are potentially a response to metallic wastes or where leachate from decomposing waste materials may be concentrated based on the resistivity values. A conductive region is also observed at depth between 200 and 225 feet along

the line, at a depth of approximately 25 feet (bgs) and extending to the depth limit of the model. The shape and appearance of this feature is very similar to those responses we observe from metallic monitoring well casings in previous surveys we have conducted. While there are no metallic well casings on this site, the monitoring well MW-04 was buried by trash in this general area, and these wells were completed with approximately 30-40 feet of bentonite. The bentonite could produce a very conductive linear response such as this, especially if it was saturated or holding moisture from the rainfall infiltration across the site. Alternatively, this could be a response to a large concentration of metallic wastes dumped in this area. This feature dominates the model results in this region, while it is likely that the waste material thickness is constant between 200 and 225 feet along the line the shape of this highly conductive feature disrupts the resistive layer contours significantly.

Between 305 and 425 feet along the line the resistive near-surface layer thins significantly, from approximately 35 to 5 feet in thickness along this distance. It thickens slightly between 425 and 500 feet along the line, increasing to a thickness of approximately 10 feet, before thinning to approximately 5 feet again and remaining of constant thickness until the end of the line at 605 feet. Another conductive region interrupts the resistive near-surface between approximately 465 and 475 feet along the line, extending to a depth of approximately 20 feet (bgs). This corresponds to the general location of a water filled pond, located immediately to the south of the line, and could be an out of plane response to this body, which is likely to be conductive based on the proximity to near surface trash, and its subsurface impacts.

The underlying conductive region displays a similar resistivity range to that observed in Line 1 along the entire length of the line, suggesting this is a response to the marine siltstone bedrock material in this region.

In a similar manner to the previous lines, we can apply these relationships to the model resistivity results enables us to highlight areas that are potentially a response to the waste materials dumped at the site (Figure 12).

4.4 LINE 4

Figure 13 displays the modeled resistivity results for Line 4, for the modified Wenner electrode configuration, which runs in a northwest to southeast direction. Line 4 started just to the south of the top of the steep slope on the northwest limit of the dump, and ran up to intersect and run parallel to the access road to the top of the dump, then across the ridge on top of the dump area, before running down the slope on the eastern side of the dump to the edge of the wooded area. The model results display a two-layer structure; with a resistive continuous near-surface layer, which varies in thickness and potentially represents the waste material. This overlies a more conductive layer, which extends to the depth limits of the model, and likely represents the underlying bedrock material.

Line 4 started in the vicinity of the end of Line 1, on the top of the steep slope around the northwest limits of the dump. The resistive near-surface layer extends between approximately 15 and 570 feet, the lateral limits of the model results. If we used the previously described resistivity value cut-off for the waste materials of approximately 55 Ωm (Log_{10} resistivity value 1.75) this would indicate a waste material thickness in excess of 100 feet for the majority of this line. This is unrealistic compared to the site history and waste depth estimates, and a more realistic interpretation is that the bedrock material underlying this line is more resistive, possibly indicating a competent and pervasive marine conglomerate bedrock material in this area. We noted a few instances along the line where we encountered conglomerate at the surface that prevented us from driving in electrodes to a depth greater than an inch or two. We observed a similar response in bedrock resistivity range for the northern portion of Line 2, which displays a more resistive values in the conglomerate outcrop areas on the top of the dump area compared to the siltstone dominated areas to the south. We do not have a good constraint on what the cut-off resistivity value should be related to the marine conglomerate bedrock material. However, the results from Lines 2 and 4 would indicate, from visual inspection of the high gradient regions within the models, resistivity values greater than approximately 280 Ωm (Log_{10} resistivity value 2.45) are associated with dumped waste materials, in those areas.

Applying this relationship would indicate an average waste material thickness of approximately 25 feet between 15 and 95 feet along the line. The near-surface layer then undulates between approximately 95 and 200 feet along the line, with the thickness ranging between approximately 12 and 25 feet. Across the top of the dump area, the waste material layer appears constant with an average thickness of approximately 6 feet. The near-surface resistive layer associated with the waste materials then appears to thicken as we proceed down the slope on the eastern edge of the dump, to approximately 18 feet thick at 530 feet along the line, where we begin to have very limited imaging depths at the edge of the model results.

As discussed above, the underlying conductive region displays a more resistive range of resistivity values to those observed in Line 1 along the entire length of the line, suggesting this is potentially a response to the marine conglomerate bedrock material in this region. A return to a similar resistivity range in Line 1 is observed at the depth limit of the model results in the center of the line, potentially indicating siltstone bedrock material is underlying the conglomerate, although model resolution is limited at these depths.

In a similar manner to the previous lines, we can apply these relationships to the model resistivity results which enables us to highlight areas that are potentially a response to the waste materials dumped at the site (Figure 14).

4.5 LINE 5

Figure 15 displays the modeled resistivity results for Line 5, for the modified Wenner electrode configuration, which runs in a southeast to northwest direction. Line 5 started on the edge of the access road in the vicinity of the start of Line 1, ran across the access road and then down into the east-west trending ravine area below, and to the west of the access road, it continued running across the slope, roughly parallel to the west creek. The model results display a two-layer structure; with a resistive fairly continuous near-surface layer, which varies in thickness and potentially represents the waste material. This overlies a more conductive layer, which extends to the depth limits of the model, and likely represents the underlying marine siltstones bedrock material.

Line 5 started on the access road to dump and was estimated to be beyond the southern limit of the waste and so on underlain by natural geological material. Between approximately 15 and 75 feet along the line the model indicates a conductive subsurface, likely representing the underlying marine siltstone bedrock material. At approximately 75 feet along the line an abrupt change to more resistive material is observed in the near surface, and likely represents waste material. This near-surface layer, located between approximately 75 and 450 feet along the line, is initially approximately 10 feet thick. At approximately 100 feet along the line this increases to approximately 30 feet in thickness, and remains constant until approximately 205 feet along the line. Between 205 and 330 feet along the line a number of highly conductive features are observed, which appear more conductive than the average resistivity value expected for the siltstone bedrock material. These are potentially responses to metallic wastes or where leachate from decomposing waste materials may be concentrated, based on the resistivity values. Based on this, the waste material layer appears to thin between 205 and 260 feet along the line, to a thickness of approximately 15 feet. Between approximately 260 and 345 feet along the line, assuming the conductive feature is associated with the waste, the waste materials layer thickens again, to an approximate thickness of 30 feet. The layer then thins to approximately 20 feet thickness at 360 feet along the line and remains constant until the end of the line, at approximately 450 feet.

The underlying conductive region displays a similar resistivity range to that observed in Line 1 along the entire length of the line, suggesting this is a response to the marine siltstone bedrock material in this region.

In a similar manner to the previous lines, we can apply these relationships to the model resistivity results which enables us to highlight areas that are potentially a response to the waste materials dumped at the site (Figure 16).

4.6 LINE 6

Figure 17 displays the modeled resistivity results for Line 6, for the modified Wenner electrode configuration, which runs in a southeast to northwest direction. Line 6 started in a small gully on the western edge of the ridge on top of the dump area, it then followed the top of the steep slope on the southern edge of the top of the dump area (approximately 10-15 feet back from the edge), before running down the slope on the eastern side of the dump to the edge of the wooded area. The model results display a two-layer structure; with a resistive discontinuous near-surface layer, which varies in thickness and potentially represents the waste material. This overlies a more conductive layer, which extends to the depth limits of the model, and likely represents the underlying bedrock material.

Line 6 started in a small gully between two bedrock outcroppings and it is assumed the first approximately 20-30 feet on the line was underlain by natural geological material. Between approximately 15 and 40 feet along the line the model indicates a fairly conductive subsurface, likely representing the underlying marine conglomerate bedrock material. At approximately 40 feet along the line an abrupt change to more resistive material is observed in the near surface. This near-surface layer, located between approximately 40 and 70 feet along the line, is approximately 5 feet thick based on the resistivity value relationship derived earlier for the marine conglomerate bedrock areas. At approximately 70 feet along the line the model results indicates the near surface becomes conductive, with this region extending to approximately 205 feet along the line. With the exception of the area between approximately 70 and 105 feet along the line, the conductive region extends to the depth limit of the model. A number of outcrops of the marine conglomerate bedrock material are observed in the section of the line, between approximately 70 and 195 feet, indicating this region is likely a response to this bedrock material. The cause of the more resistive feature between approximately 75 and 105, and between a depth of approximately 5 to 15 feet (bgs), is uncertain, although it is potentially a change in lithology/composition associated with the conglomerate bedrock, possibly a more competent section of the conglomerate. Between approximately 205 feet along the line and the end of the line, located at approximately 410 feet, a resistive near-surface layer is observed. This has a constant thickness of approximately 10 feet between 205 and 260 feet along the line, before increasing to a thickness of approximately 25 feet at 275 feet along the line. The thickness of this layer decreases to approximately 10 feet at 315 feet along the line, before increasing in thickness to approximately 30 feet at 355 feet along the line. The depth of penetration is limited beyond 355 feet along the line due to the proximity of the edge of the model and the increasingly steep topography towards the end of the survey line.

As discussed the underlying conductive region displays a more resistive resistivity range to that observed in Line 1 along the entire length of the line, suggesting this is potentially a response to the marine conglomerate bedrock material in this region.

In a similar manner to the previous lines, we can apply these relationships to the model resistivity results which enables us to highlight areas that are potentially a response to the waste materials dumped at the site (Figure 18).

4.7 LINE 7

Figure 19 displays the modeled resistivity results for Line 7, for the modified Wenner electrode configuration, which runs in a northwest to southeast direction. Line 7 started on a bench in the steep slope on the northern limit of the dump, and followed this to the east before climbing up to the top of the dump, then across the ridge on top of the dump area, before running down the slope on the eastern side of the dump to the edge of the wooded area. The model results display a two-layer structure; with a resistive continuous near-surface layer, which varies in thickness and potentially represents the waste material. This overlies a more conductive layer, which extends to the depth limits of the model, and likely represents the underlying bedrock material.

Line 7 started on a bench in the steep slope on the northern limits of the dump, with high concentrations of waste materials observed making up the slope and towards the base of the slope. Assuming the resistivity range prescribed to the marine conglomerate bedrock materials, which appears predominant on the northern area of the dump, a near-surface resistive layer of approximately 25 feet thickness extends between 15 and 115 feet along the line. This increases in thickness to approximately 35 feet between 115 and 135 feet along the line. The thickness then decreases gradually between approximately 135 and 215 feet along the line, to a thickness of approximately 30 feet. This layer appears more conductive at the ground surface, between approximately 125 and 215 feet along the line, possible reflecting the higher soil content of the waste materials along this bench.

Between approximately 215 and 375 feet along the line, the near-surface resistive layer remains constant, with an average thickness of 40 feet. There is some uncertainty in this region since there are a number of what appear to be isolated very resistive regions, whose resistivity values would indicate waste materials, which are separated by more conductive regions. This is potentially related to variations in composition of the waste materials in this region, with some areas containing more conductive waste (low concentrations of metallic waste for example) or waste decomposition products. The waste material layer is then observed decreasing in thickness between 375 and 410 feet along the line, from approximately 40 to 10 feet. The waste material layer then increases in thickness to approximately 30 feet, at approximately 430 feet along the line, where the penetration depth limit is reached due to the edge of the model.

As discussed the underlying conductive region displays a more resistive resistivity range to that observed in Line 1 along the entire length of the line, suggesting this is potentially a response to the marine conglomerate bedrock material in this region.

In a similar manner to the previous line, we can apply these relationships to the model resistivity results which enables us to highlight areas that are potentially a response to the waste materials dumped at the site (Figure 20).

Figure 6. General Site Map with Electrical Resistivity and Multi-Channel Analysis of Surface Wave Survey Lines.

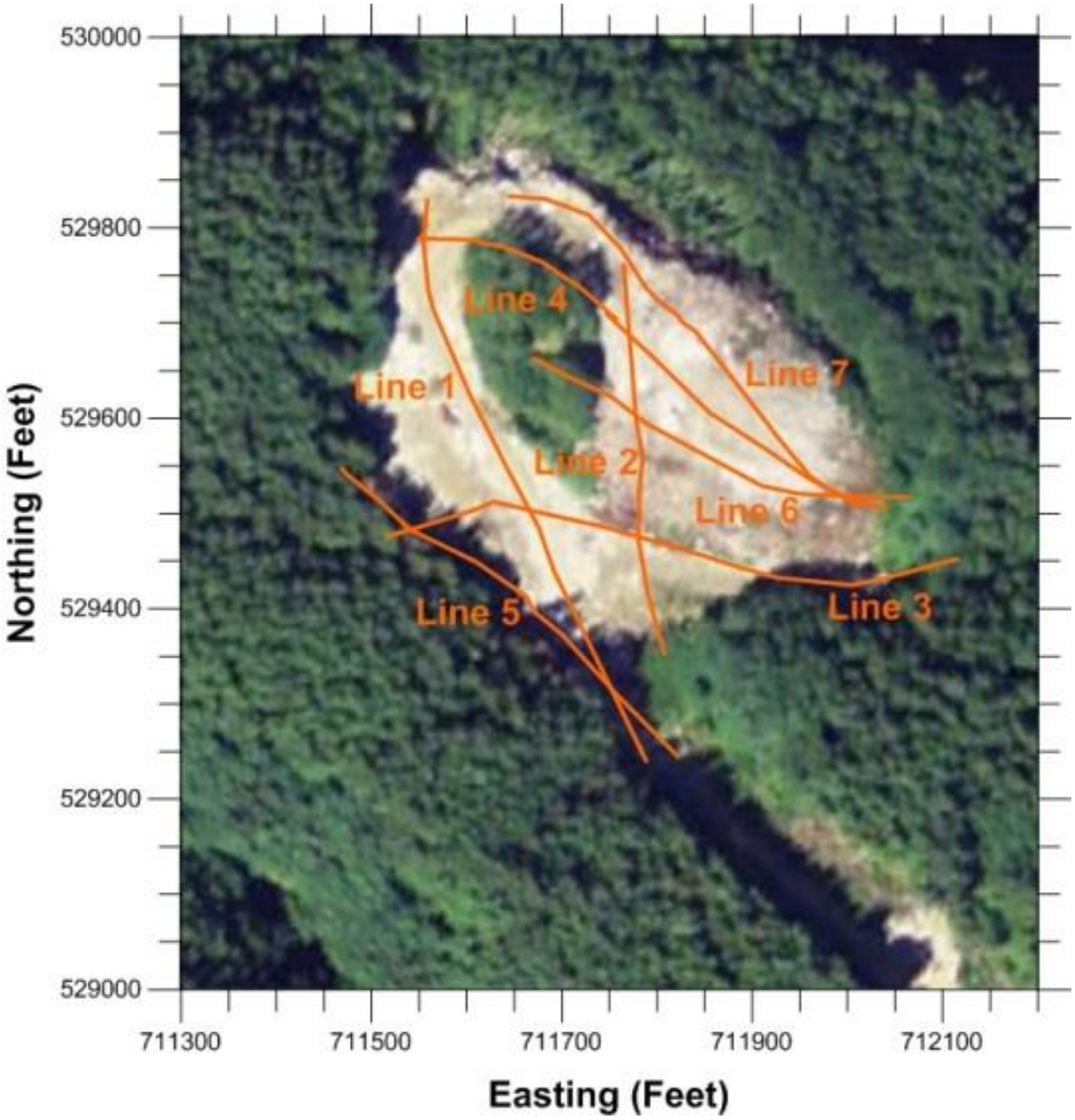


Figure 7. Line 1 Electrical Resistivity Inversion Model Results.

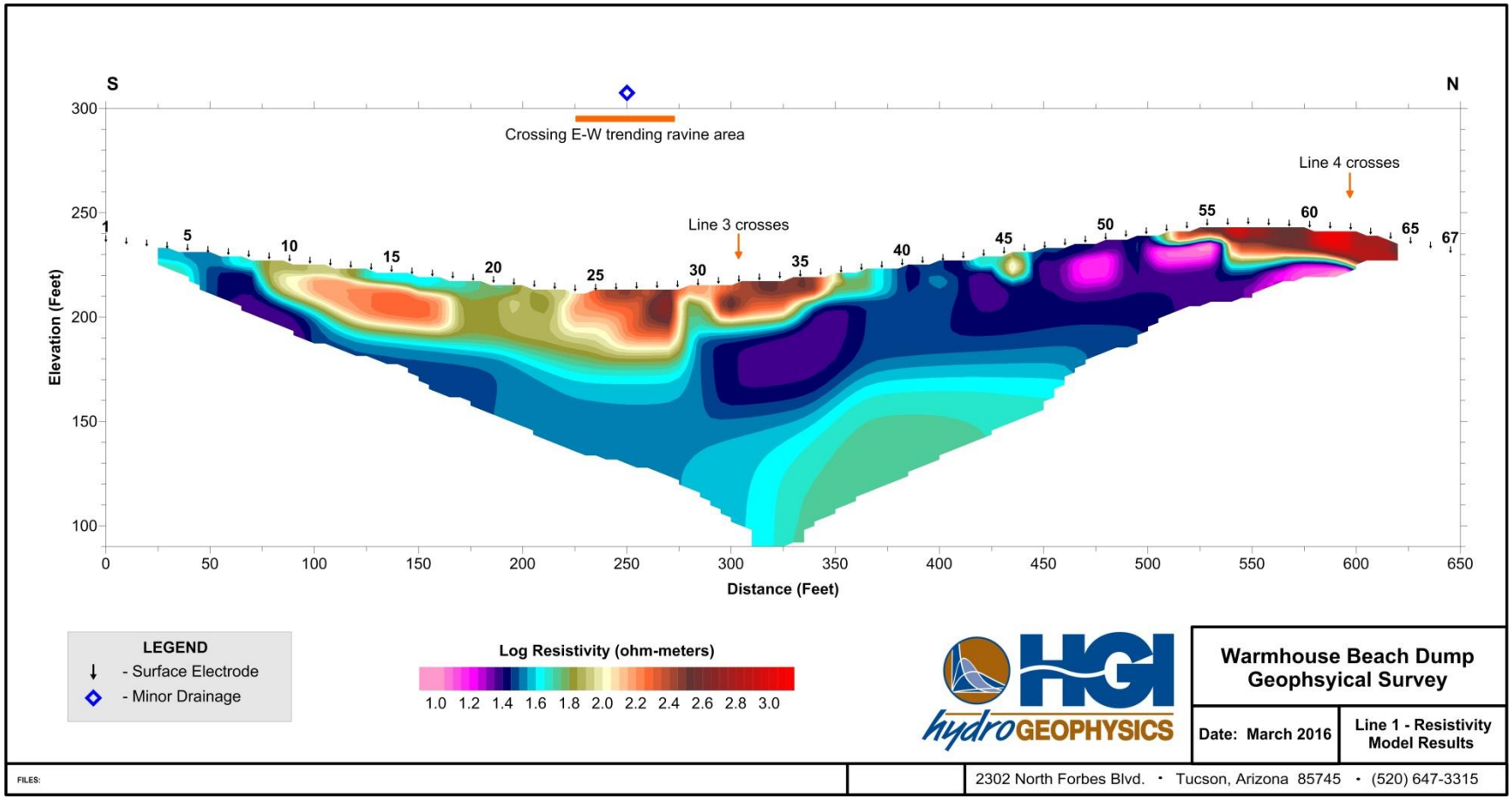


Figure 8. Line 1 Electrical Resistivity Inversion Model Results, with Interpreted Waste Material Thickness Highlighted in Red Checked Region.

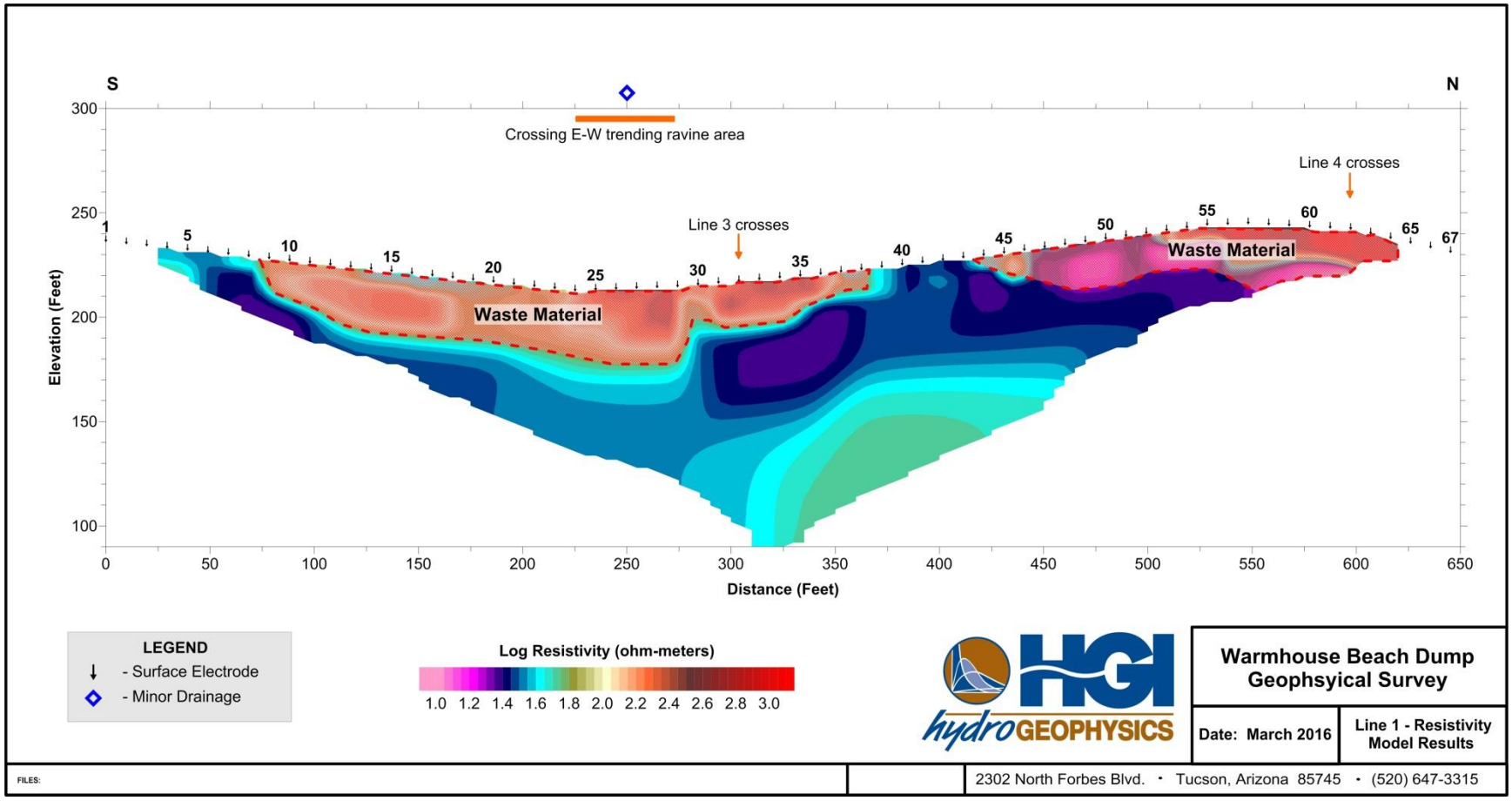


Figure 9. Line 2 Electrical Resistivity Inversion Model Results.

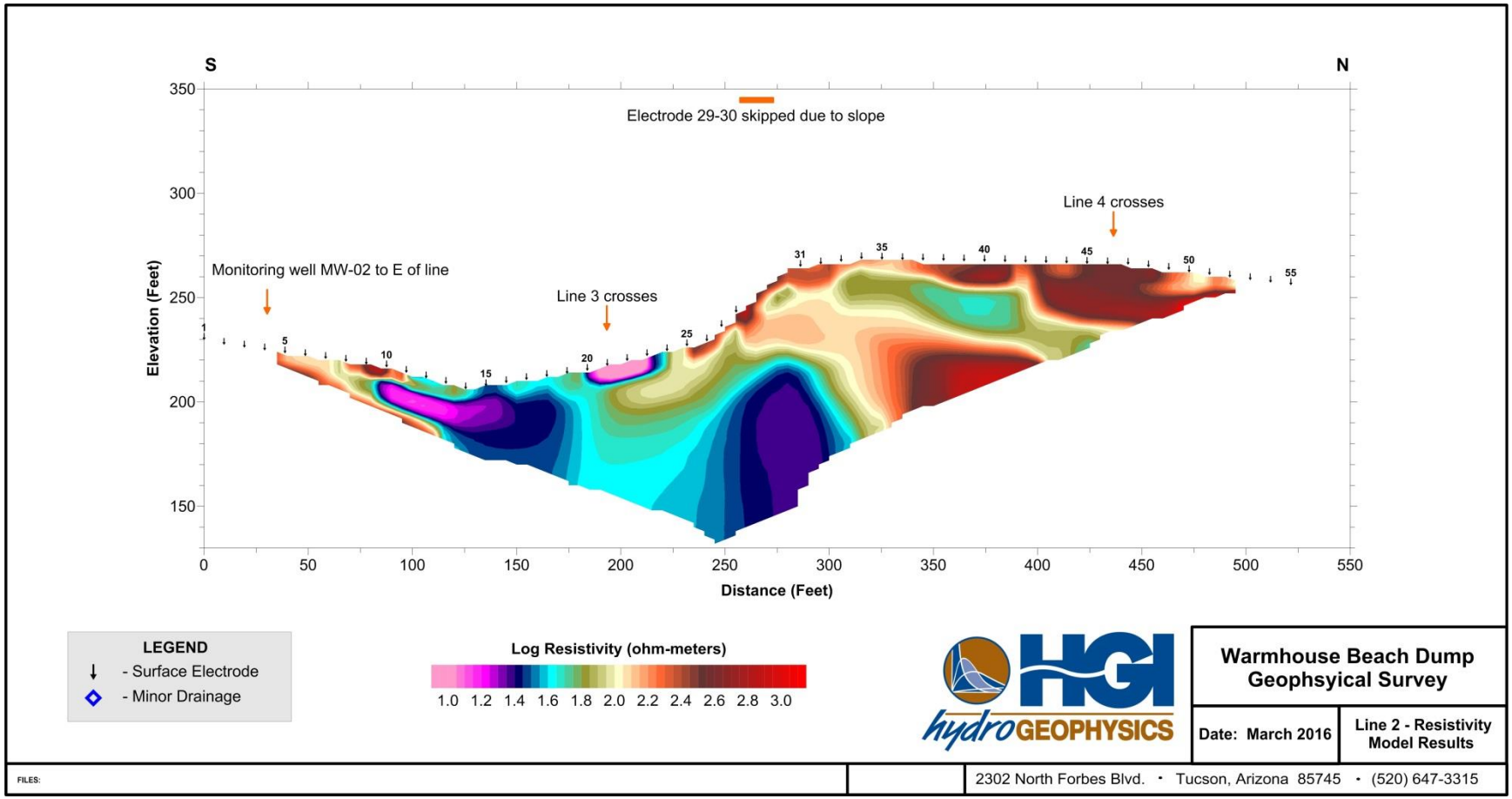


Figure 10. Line 2 Electrical Resistivity Inversion Model Results, with Interpreted Waste Material Thickness Highlighted in Red Checked Region.

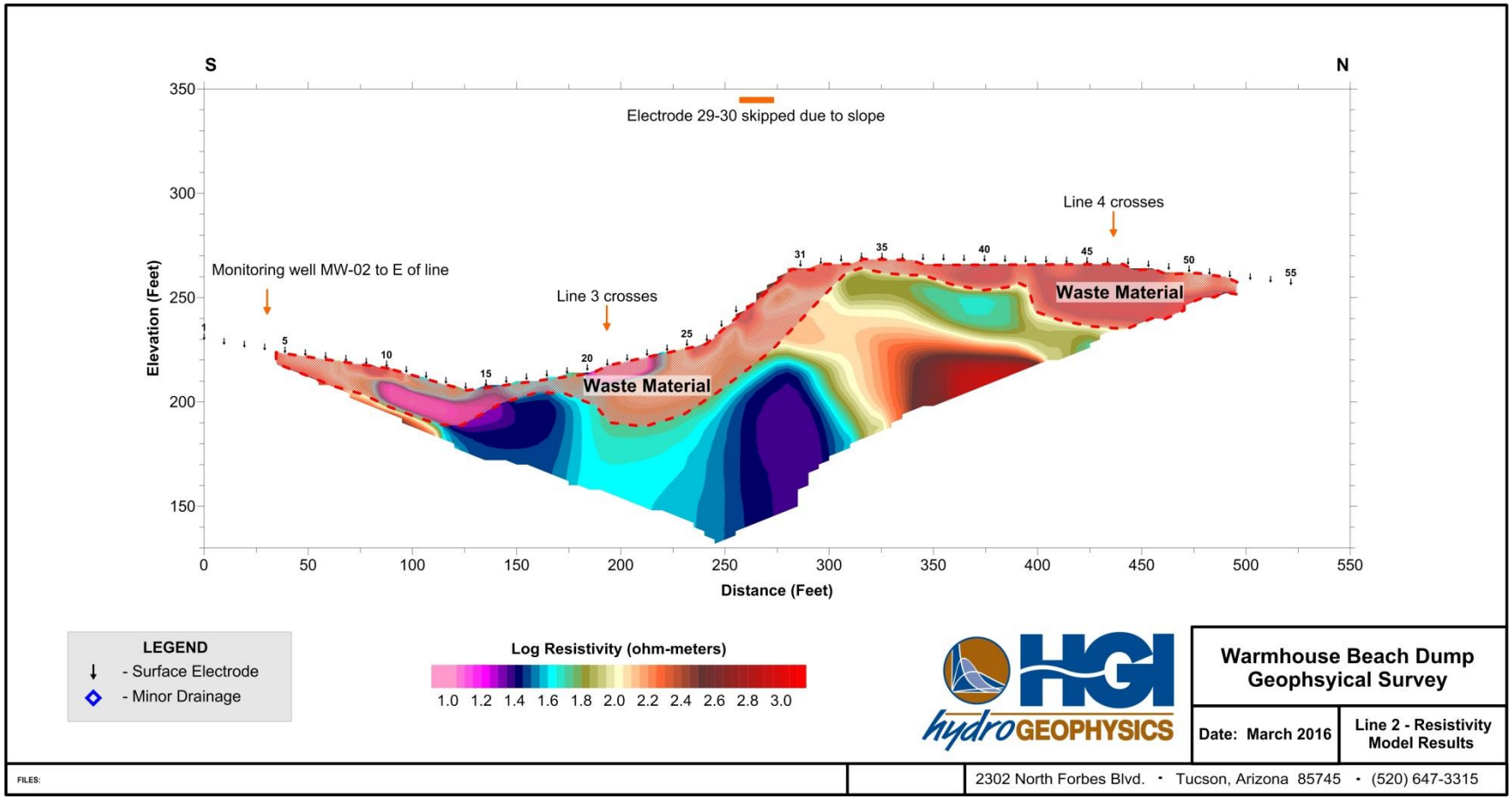


Figure 11. Line 3 Electrical Resistivity Inversion Model Results.

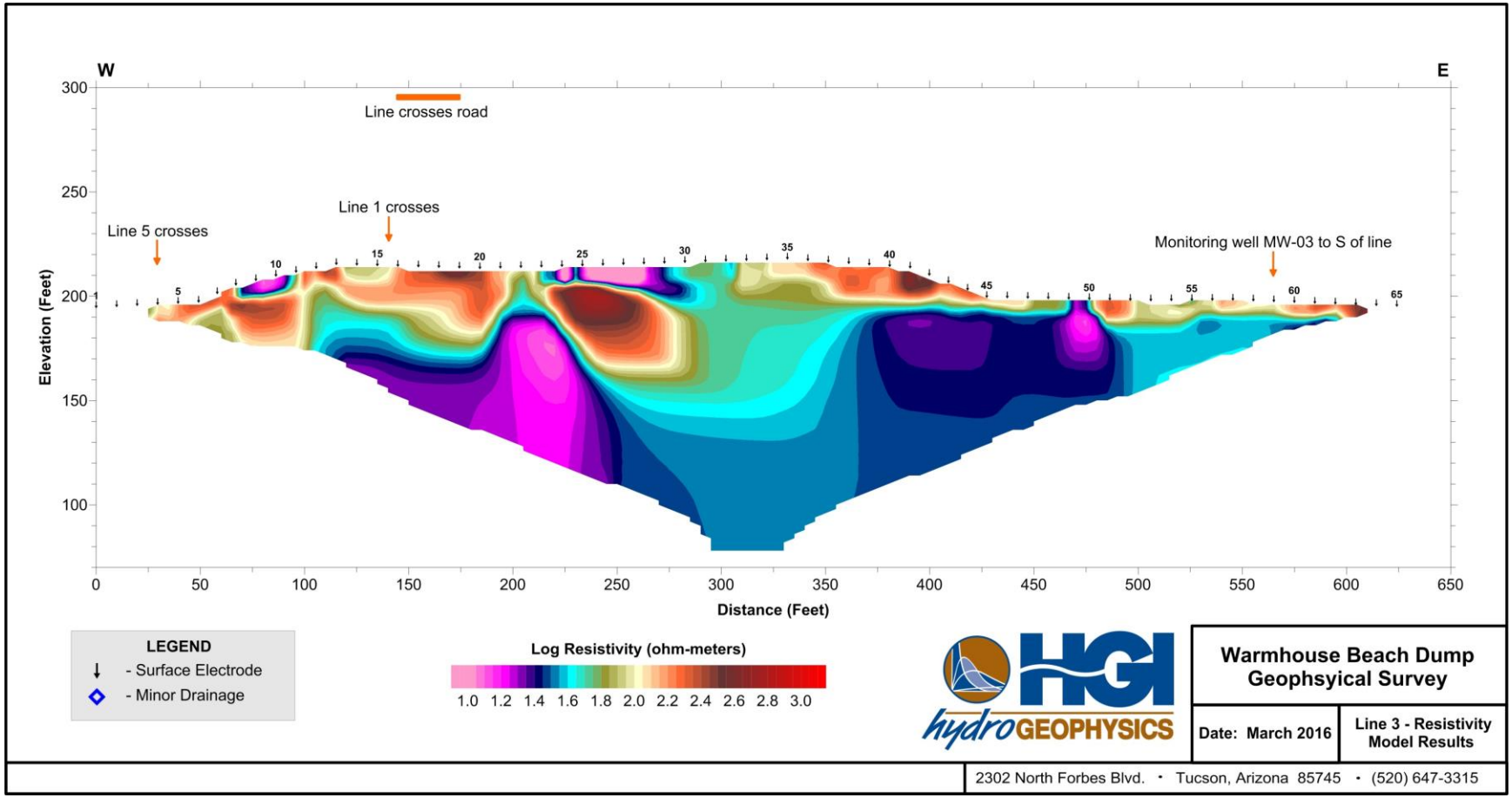


Figure 12. Line 3 Electrical Resistivity Inversion Model Results, with Interpreted Waste Material Thickness Highlighted in Red Checked Region.

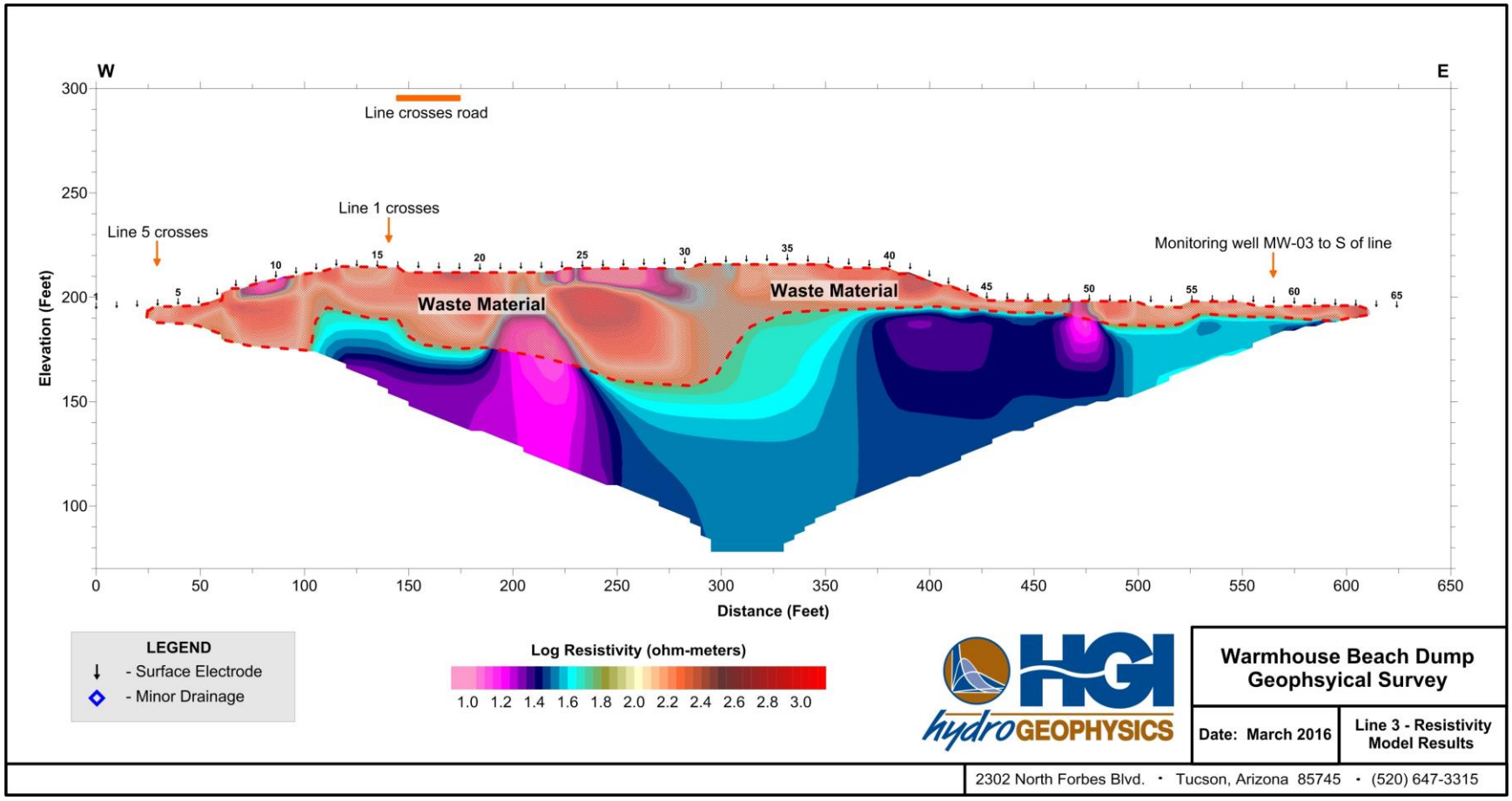


Figure 13. Line 4 Electrical Resistivity Inversion Model Results.

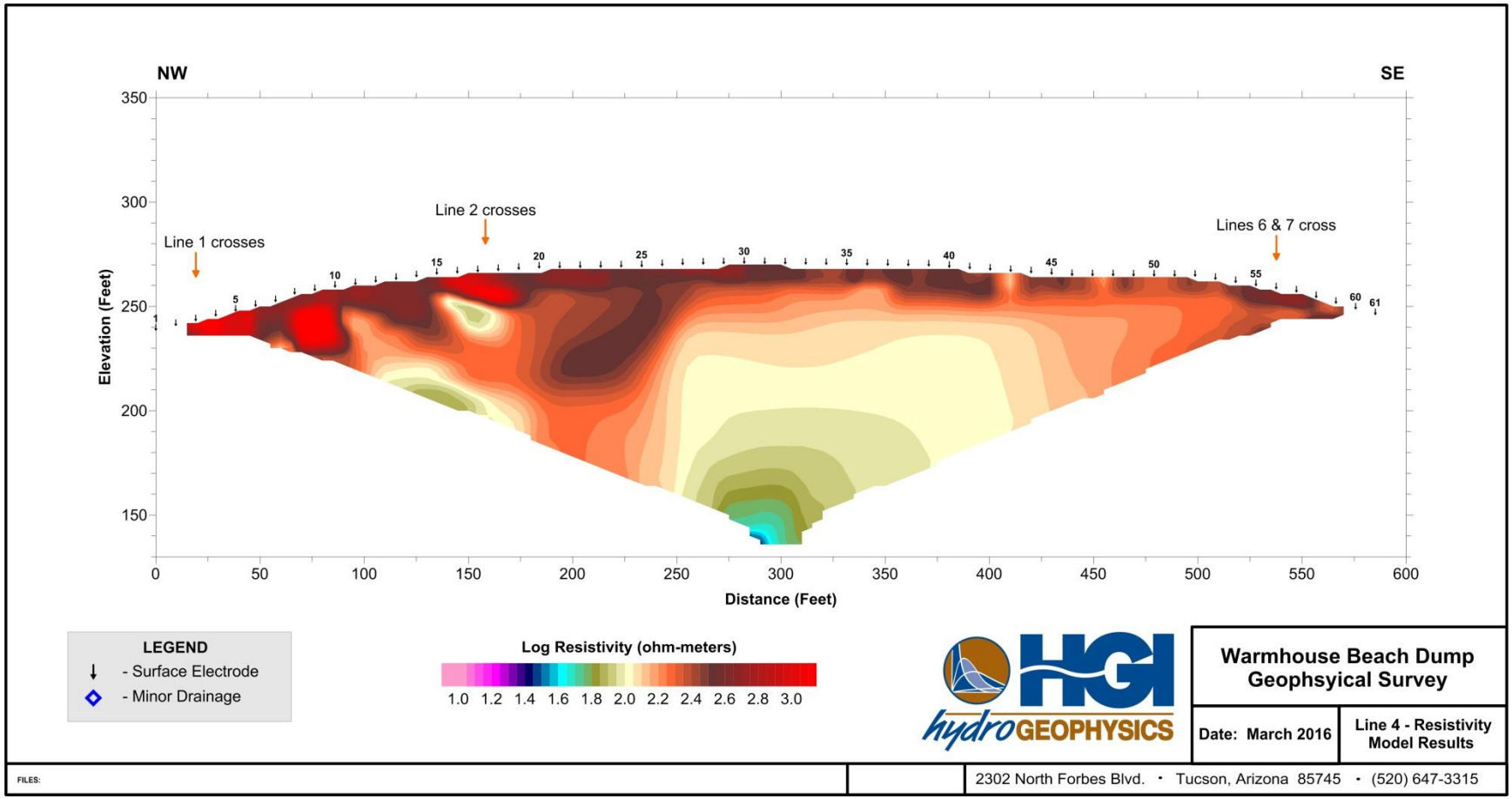


Figure 14 Line 4 Electrical Resistivity Inversion Model Results, with Interpreted Waste Material Thickness Highlighted in Red Checked Region.

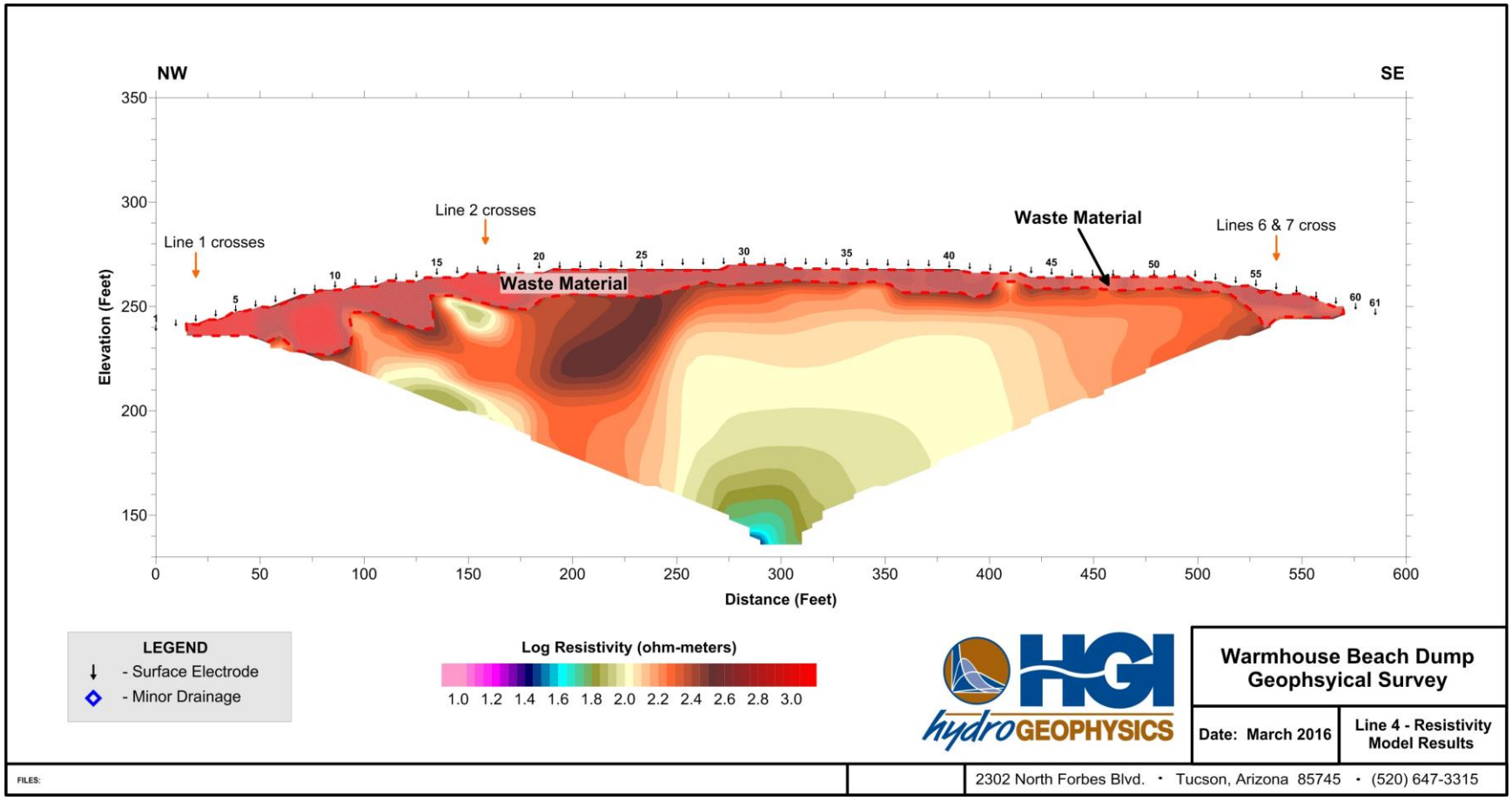


Figure 15. Line 5 Electrical Resistivity Inversion Model Results.

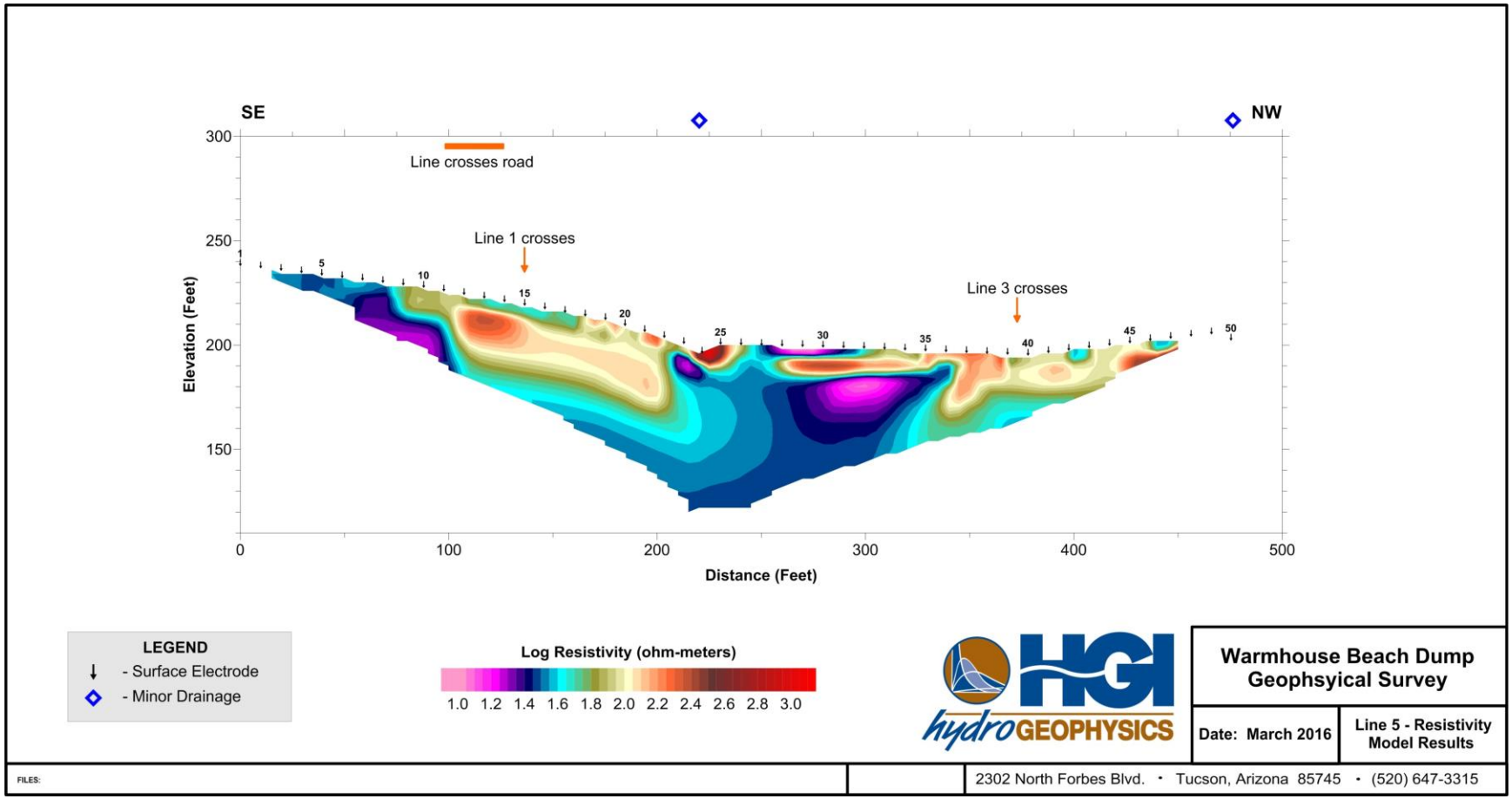


Figure 16 Line 5 Electrical Resistivity Inversion Model Results, with Interpreted Waste Material Thickness Highlighted in Red Checked Region.

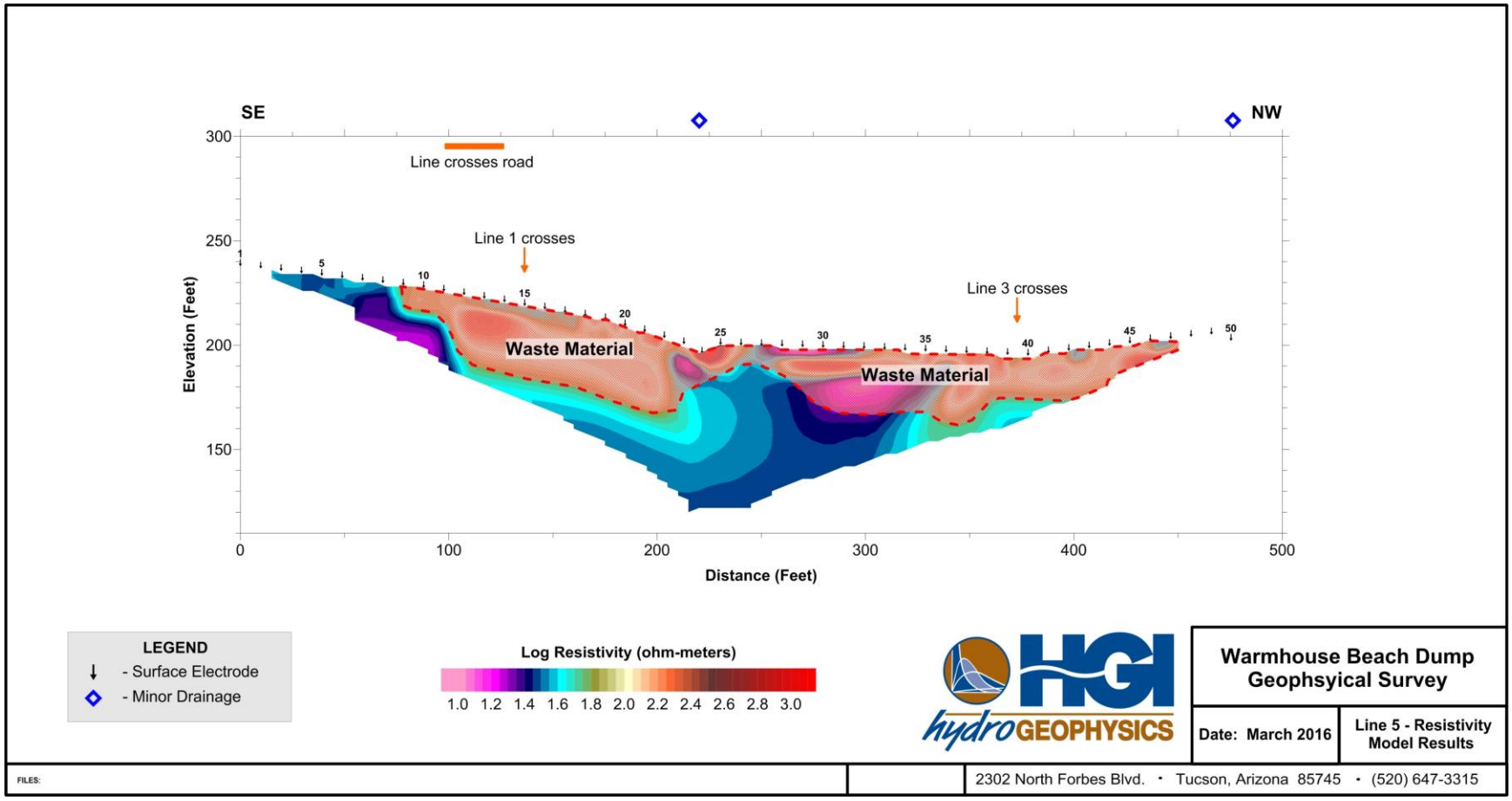


Figure 17. Line 6 Electrical Resistivity Inversion Model Results.

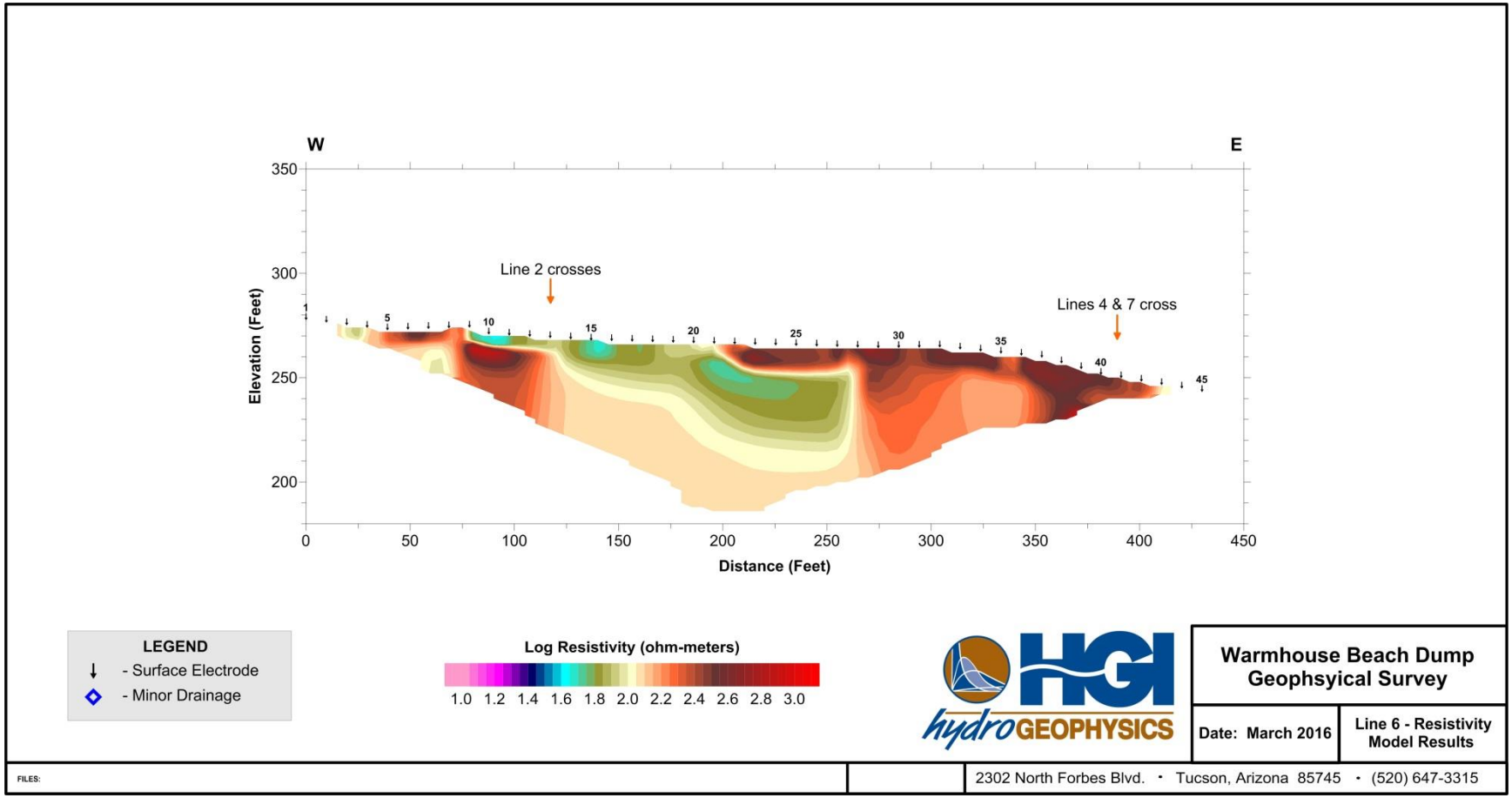


Figure 18. Line 6 Electrical Resistivity Inversion Model Results, with Interpreted Waste Material Thickness Highlighted in Red Checked Region.

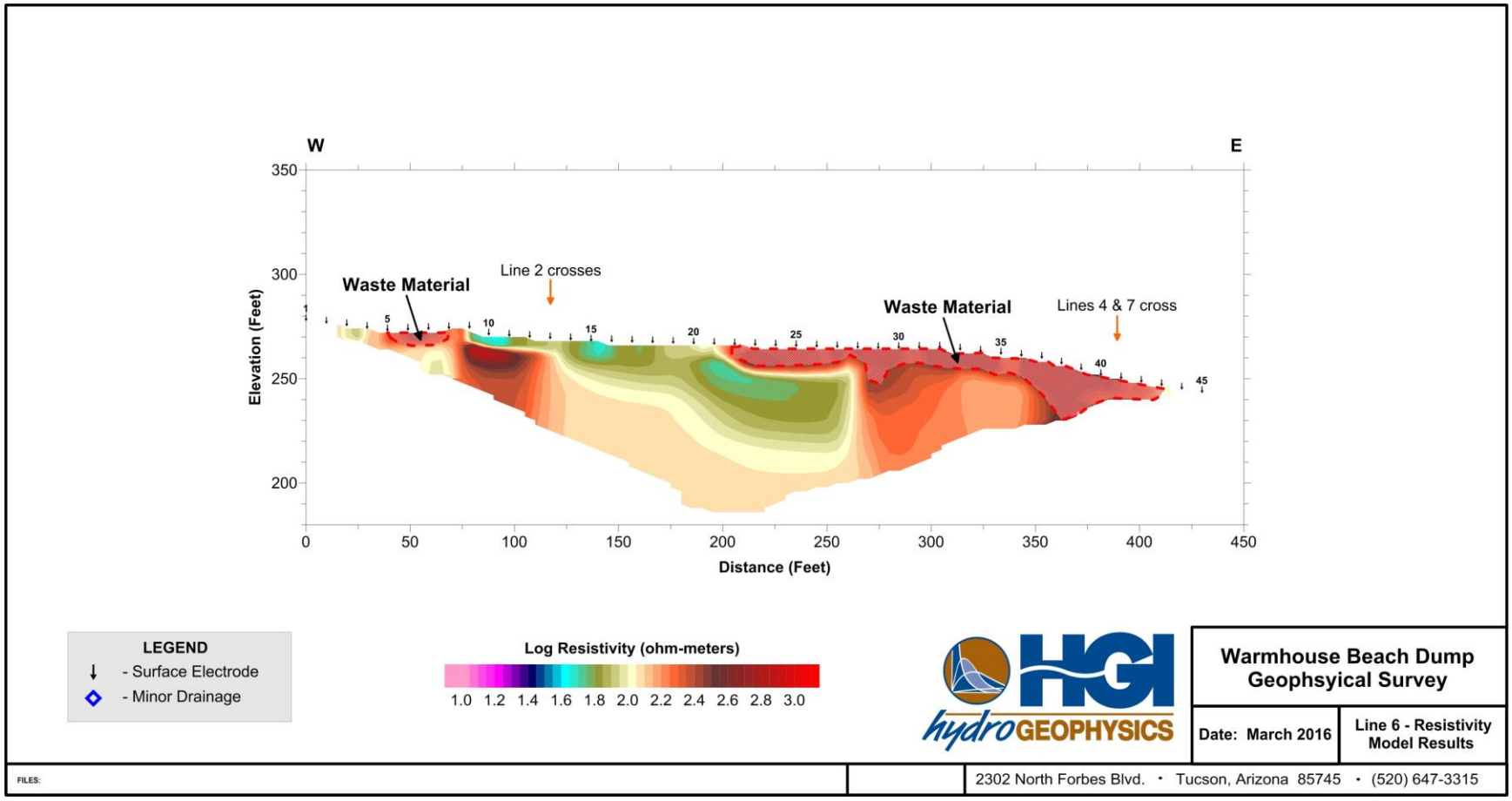


Figure 19. Line 7 Electrical Resistivity Inversion Model Results.

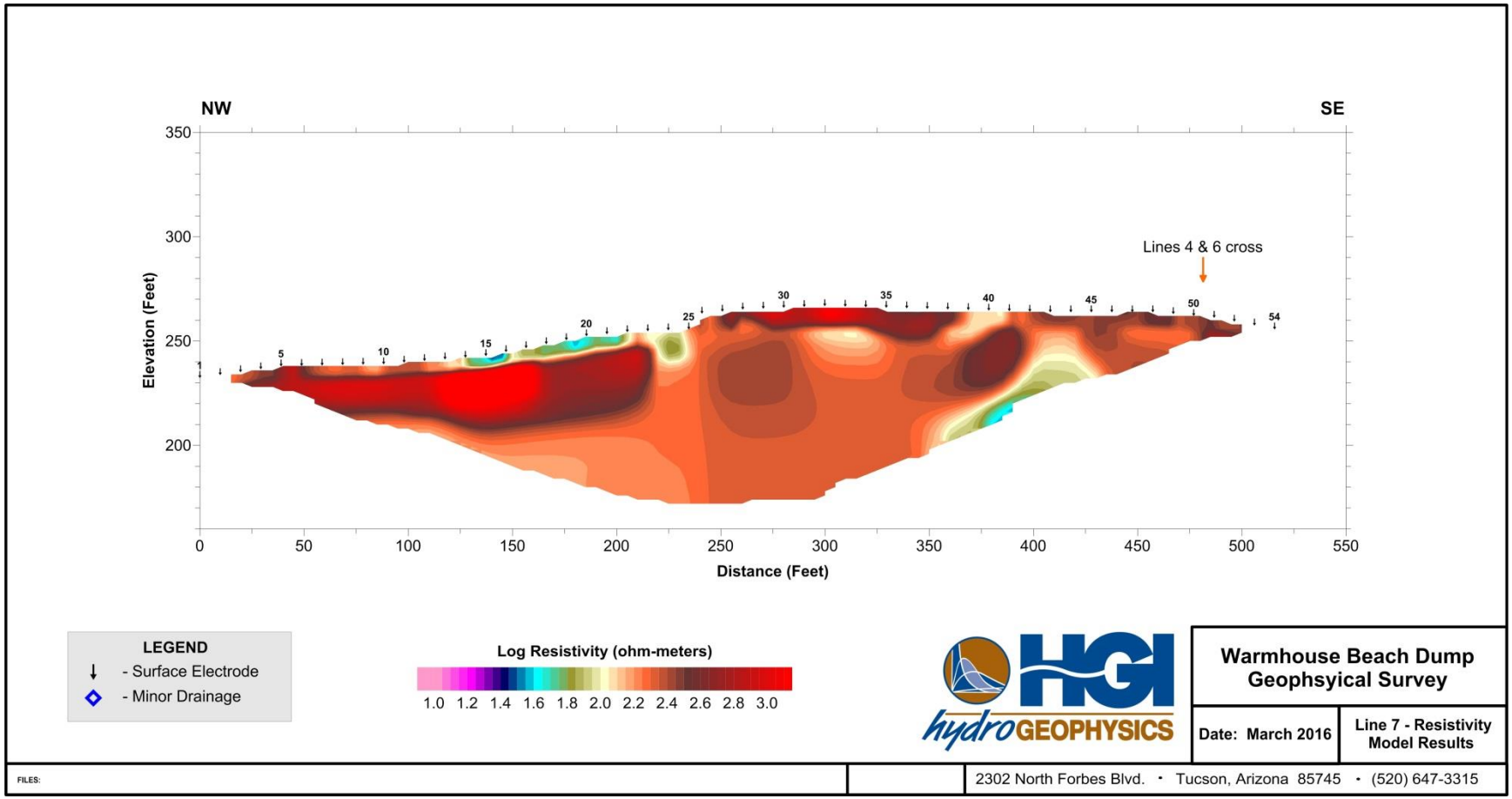
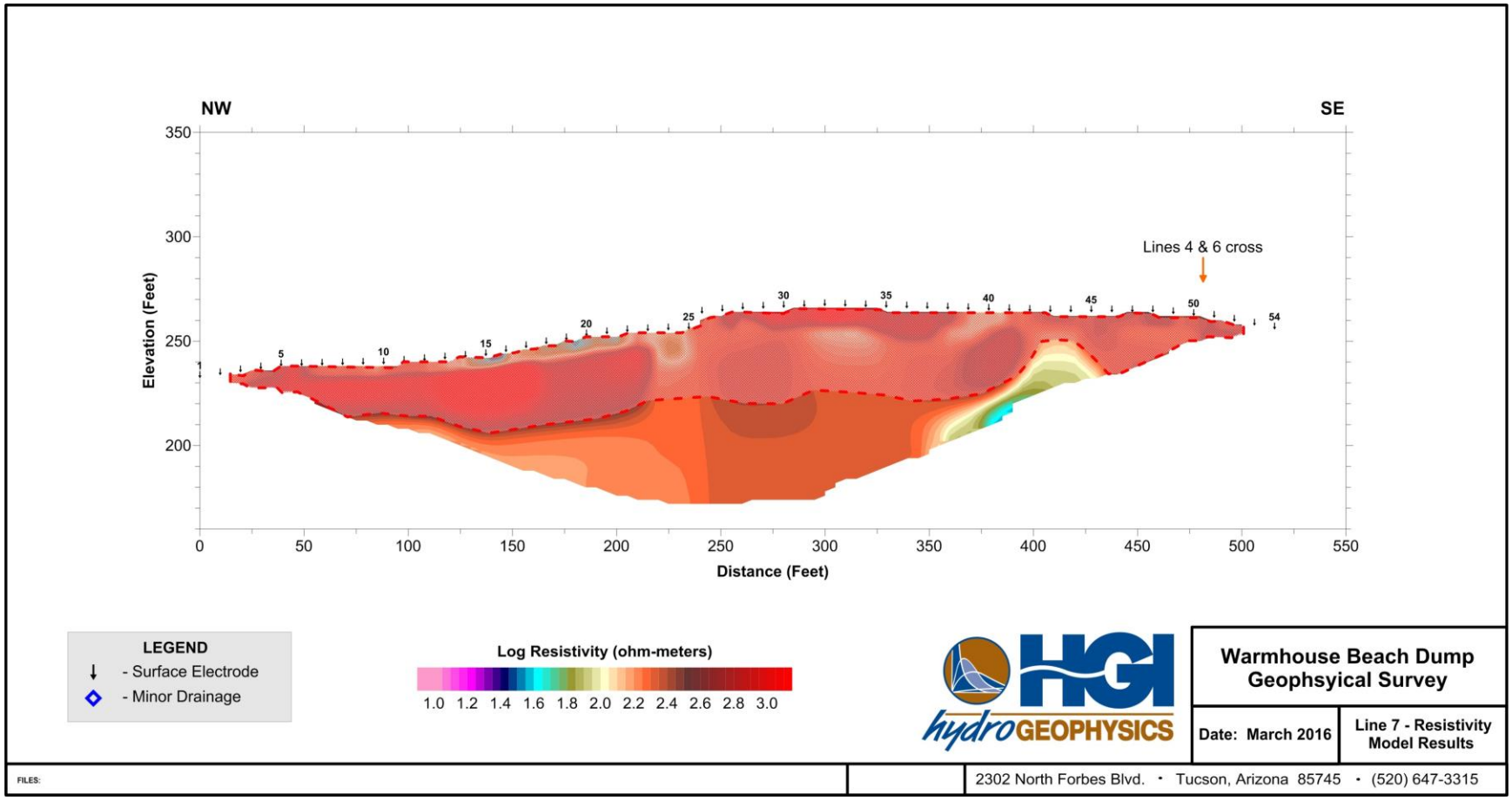


Figure 20. Line 7 Electrical Resistivity Inversion Model Results, with Interpreted Waste Material Thickness Highlighted in Red Checked Region.



5.0 SUMMARY

Geophysical characterization, which included seven lines of electrical resistivity, was completed at the Warmhouse Beach Dump Site on the Olympic Peninsula near Neah Bay, WA. Data were acquired between the 15th and 17th of March, 2016. The objective of the electrical resistivity survey was to evaluate the depth and lateral limits of the waste materials across the Warmhouse Beach Dump site to allow a determination of the volume of waste.

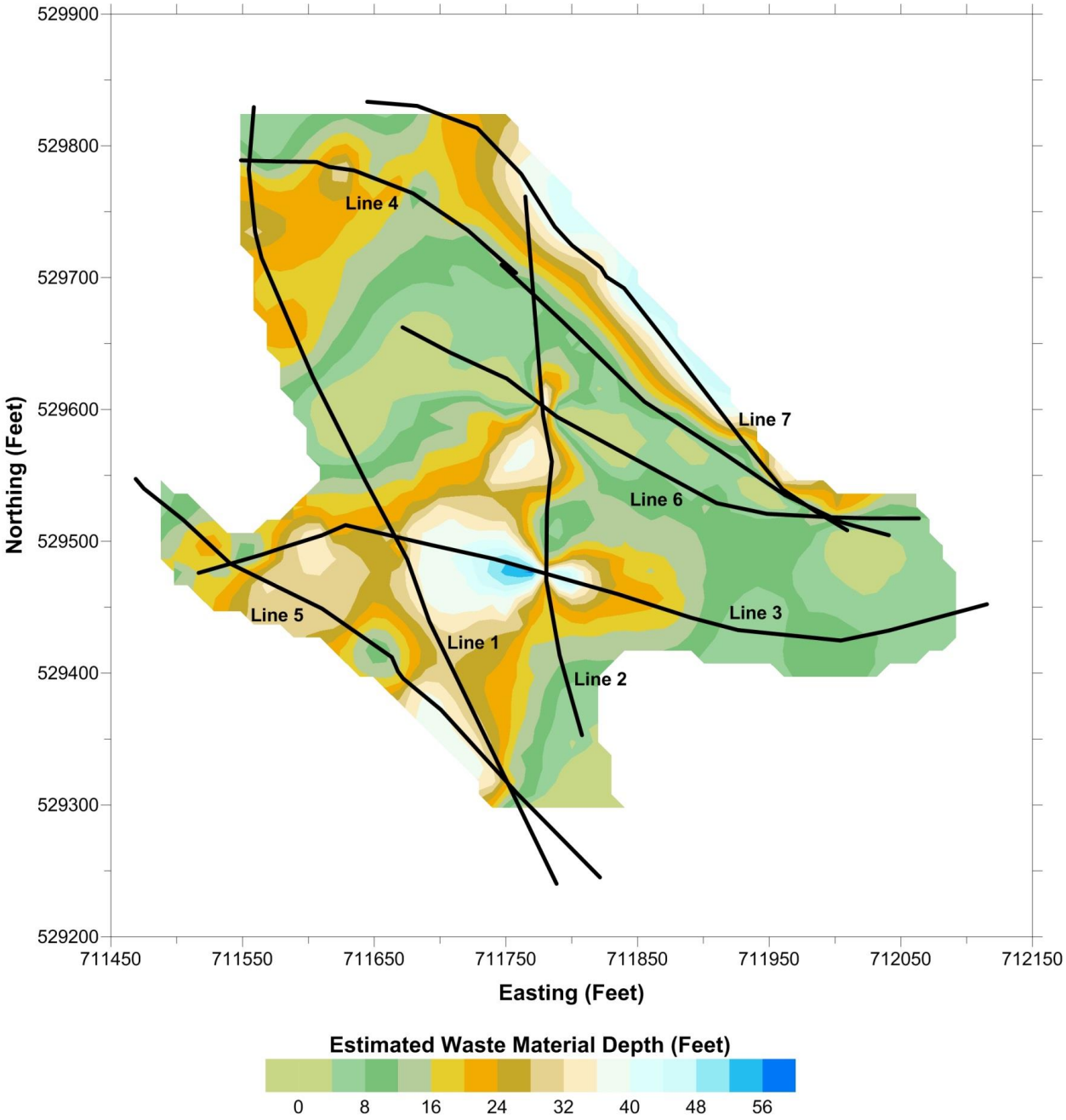
In summary;

- The Warmhouse Beach Dump had significant topographic variations across the site; with very steep slopes on most of the edges of the dump and a cliff style feature running approximately east-west through the middle of the site. Combined with the dense vegetation surrounding the dump site, this led to constraints, both safety and logistical related, on where the electrical resistivity survey lines could be placed. It was not possible in the majority of cases to extend the electrical resistivity survey lines beyond the anticipated limits of the dumped waste materials, to both capture the true lateral limits of the waste materials and provide information on the background geological material responses for improved calibration of the resistivity values.
- The seven electrical resistivity survey lines provide a reasonable distribution of coverage (given the steep topography and dense vegetation) of the major areas of interest across the Warmhouse Beach Dump site; namely the ravine area, the steep cliff style feature on the south side of the ridge, and on the north side of the ridge.
- The dumped waste materials presented as a predominantly resistive near-surface layer in the model resistivity results. A number of highly conductive regions within this layer are interpreted as potentially responses to high concentrations of metallic waste or where leachate from decomposing waste materials may be concentrated. Two relationships relating the resistivity value to the interface between the underlying geological bedrock and waste material were found to be necessary. The resistivity lines to the south and west areas of the site (Lines 1, 2, 3, and 5) appear to be underlain by more conductive marine siltstone bedrock, with waste material corresponding to resistivity values greater than approximately 55 Ωm (Log_{10} resistivity value 1.75) in this region. The resistivity lines to the north of the site, on top of the ridge area (Lines 4, 6, and 7), appear to be underlain by more resistive marine conglomerate bedrock, with waste material corresponding to resistivity values greater than approximately 280 Ωm (Log_{10} resistivity value 2.45) in this region.
- The depth of the waste materials are highlighted in Figures 8, 10, 12, 14, 16, and 18 based on the relationships described above. The interface between the waste material and underlying geological bedrock was digitized from the model resistivity profiles and analyzed to produce a map of the spatial distribution of the thickness of dumped waste in

Figure 21. This indicates a significant thickness, approximately 30 to 50 feet, of waste materials in the east to west trending ravine area. We do not have good coverage of the very steep cliff feature apart from the region around Line 2, but this indicates between approximately 20 to 30 feet thickness of waste material making up this steep slope. The area on the north/northeast limits of the dump display the thickest consistent covering of waste material, with on average approximately 40 to 50 feet of waste material indicated.

- No intrusive work (i.e. excavation or drilling) has been conducted to constrain the values in electrical resistivity are appropriate in this situation for identifying the interface between the underlying geological bedrock and waste materials in the Warmhouse Beach Dump. The interpretations are based off our understanding and assumptions made of the site and informed interpretations of the model resistivity results. Having additional information from drilling or borings would allow us to determine the thickness of waste material, and confirm and improve the resolution of the presented interpretations.

Figure 21. Estimated Waste Material Depths across the Warmhouse Beach Dump Site based on the Interpreted Interface in the Model Resistivity Results.



6.0 REFERENCES

Binley, A., and Kemna, A., 2005, DC resistivity and induced polarization methods: *in* Hydrogeophysics, Rubin, Y., and Hubbard, S. S. (ed), Springer, The Netherlands, 129-156.

deGroot-Hedlin, C., and S.C. Constable, 1990, Occam's inversion to generate smooth, two-dimensional models from magnetotelluric data: Geophysics 55, 1613– 1624.

Dey, A., and H.F. Morrison, 1979, Resistivity modeling for arbitrarily shaped three-dimensional structures: Geophysics, 44, 753-780.

Ellis, R.G., and D.W. Oldenburg, 1994, Applied geophysical inversion: Geophysical Journal International, 116, 5-11.

Loke, M.H., I. Acworth, and T. Dahlin, 2003, A comparison of smooth and blocky inversion methods in 2D electrical imaging surveys: Exploration Geophysics, 34, 182-187.

Ridolfi Engineers Inc. (Ridolfi), 2003, Makah Indian Reservation Draft Warmhouse Beach Dump Closure Plan, February.

Rucker, D.F., Levitt, M.T., Greenwood, W.J., 2009. Three-dimensional electrical resistivity model of a nuclear waste disposal site. Journal of Applied Geophysics 69, 150-164.

Rucker, D.F., G.E. Noonan, and W.J. Greenwood, 2011. Electrical resistivity in support of geologic mapping along the Panama Canal. Engineering Geology 117(1-2):121-133.

Sasaki, Y., 1989, Two-dimensional joint inversion of magnetotelluric and dipole-dipole resistivity data: Geophysics, 54, 254-262.

Telford, W. M., Geldart, L. P., and Sherriff, R. E., 1990, Applied Geophysics (2nd Edition), Cambridge University Press.

Appendix C
Stream Gaging Data and Calculations

WARMHOUSE BEACH DUMP SITE
STREAM GAGE AREA-VELOCITY METHOD CALCULATION

Event No:	1
Stream ID:	Classet Creek 1
Location ID:	BKGD-01
Measurement Date/Time:	3/15/16 13:26

	X	D		W	A	V	Q		
Measurement #	Measured Distance from Initial Point (**X**) (ft)	Bed Depth Measurment (**D**) (ft)	Depth of Gage Observation from Surface (ft) 0.6 x **D**	Width of Interval (**W**) (ft)	Area of Interval (**A**) (ft2)	Point Velocity Measurement (**V**) (ft/s)	Interval Discharge Flow (**Q**) (ft3/s) **A** x **V**	Interval Discharge Flow (**Q**) (gpm) **A** x **V**	**Click here for Tip**
0 (Initial Point)	*3*	*0.250*	*0.15*	*0.25*	*0.063*	*0.00*	*0.00*	*0.00*	
1	3.5	0.300	0.18	0.50	0.150	0.03	0.00	2.02	
2	4	0.450	0.27	0.50	0.225	0.60	0.14	60.59	
3	4.5	0.650	0.39	0.50	0.325	1.85	0.60	269.86	
4	5	0.800	0.48	0.50	0.400	3.40	1.36	610.41	
5	5.5	0.900	0.54	0.50	0.450	3.95	1.78	797.80	
6	6	1.000	0.60	0.50	0.500	3.20	1.60	718.13	
7	6.5	0.950	0.57	0.50	0.475	2.70	1.28	575.63	
8	7	0.950	0.57	0.50	0.475	2.71	1.29	577.76	
9	7.5	0.850	0.51	0.50	0.425	2.80	1.19	534.11	
10	8	0.800	0.48	0.50	0.400	2.85	1.14	511.67	
11	8.5	0.750	0.45	0.50	0.375	2.90	1.09	488.10	
12	9	0.650	0.39	0.50	0.325	3.30	1.07	481.37	
13	9.5	0.650	0.39	0.50	0.325	1.80	0.59	262.57	
14	10	0.650	0.39	0.50	0.325	1.60	0.52	233.39	
15	10.5	0.600	0.36	0.50	0.300	1.60	0.48	215.44	
16	11	0.600	0.36	0.50	0.300	1.70	0.51	228.90	
17	11.5	0.500	0.30	0.50	0.250	0.80	0.20	89.77	
18	12	0.450	0.27	0.50	0.225	1.20	0.27	121.18	
19	12.5	0.400	0.24	0.50	0.200	1.20	0.24	107.72	
20	13	0.450	0.27	0.50	0.225	1.40	0.32	141.38	
21	13.5	0.500	0.30	0.50	0.250	0.60	0.15	67.32	
22									
23									
24									
25									
26									
27									
28									
29						0.00			
(End Point)	*14*	*0.000*	*0.00*	*0.250*	*0.000*	*0.00*	*0.00*	*0.00*	

Stream Cross-sectional Area (ft2)	6.9875	
Average Flow Velocity (ft/s)	1.76	
Total Discharge Rate	**15.808 cfs**	**7095.12 gpm**

USER NOTES
1) Enter your data into the green columns below.
2) The other columns should calculate automatically
3) Sequentially fill Measurements # 0 (Initial Pt) thru 29 as available. Measurement #30 is always the End (last) Data Point. Do not add or remove rows without checking checking formulas for completeness and accuracy.

WARMHOUSE BEACH DUMP SITE
STREAM GAGE AREA-VELOCITY METHOD CALCULATION

Event No:	1
Stream ID:	Unnamed Stream 1
Location ID:	US-01
Measurement Date/Time:	3/15/16 15:40

	X	D		W	A	V	Q		
Measurement #	Measured Distance from Initial Point (**X**) (ft)	Bed Depth Measurment (**D**) (ft)	Depth of Gage Observation from Surface (ft) 0.6 x **D**	Width of Interval (**W**) (ft)	Area of Interval (**A**) (ft2)	Point Velocity Measurement (**V**) (ft/s)	Interval Discharge Flow (**Q**) (ft3/s) **A** x **V**	Interval Discharge Flow (**Q**) (gpm) **A** x **V**	**Click here for Tip**
0 (Initial Point)	*0*	*0.090*	*0.05*	*0.13*	*0.011*	*0.04*	*0.00*	*0.20*	
1	0.25	0.100	0.06	0.25	0.025	0.61	0.02	6.84	
2	0.5	0.070	0.04	0.25	0.018	1.11	0.02	8.72	
3	0.75	0.050	0.03	0.25	0.013	0.67	0.01	3.76	
4									
5									
6									
7									
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29									
(End Point)	*1*	*0.010*	*0.01*	*0.13*	*0.00*	*0.65*	*0.00*	*0.36*	

Stream Cross-sectional Area (ft2)	0.0675	
Average Flow Velocity (ft/s)	0.62	
Total Discharge Rate	**0.044 cfs**	**19.89 gpm**

USER NOTES
1) Enter your data into the green columns below.
2) The other columns should calculate automatically
3) Sequentially fill Measurements # 0 (Initial Pt) thru 29 as available. Measurement #30 is always the End (last) Data Point. Do not add or remove rows without checking checking formulas for completeness and accuracy.

WARMHOUSE BEACH DUMP SITE
STREAM GAGE AREA-VELOCITY METHOD CALCULATION

Event No:	1
Stream ID:	West Creek 1
Location ID:	WC-03
Measurement Date/Time:	3/18/16 14:40

	X	D		W	A	V	Q		
Measurement #	Measured Distance from Initial Point (**X**) (ft)	Bed Depth Measurment (**D**) (ft)	Depth of Gage Observation from Surface (ft) 0.6 x **D**	Width of Interval (**W**) (ft)	Area of Interval (**A**) (ft2)	Point Velocity Measurement (**V**) (ft/s)	Interval Discharge Flow (**Q**) (ft3/s) **A** x **V**	Interval Discharge Flow (**Q**) (gpm) **A** x **V**	**Click here for Tip**
0 (Initial Point)	*0*	*0.000*	*0.00*	*0.13*	*0.000*	*0.00*	*0.00*	*0.00*	
1	0.25	0.500	0.30	0.25	0.125	0.00	0.00	0.00	
2	0.5	0.125	0.08	0.25	0.031	0.00	0.00	0.00	
3	0.75	0.150	0.09	0.25	0.038	0.00	0.00	0.00	
4	1	0.200	0.12	0.25	0.050	0.08	0.00	1.80	
5	1.25	0.200	0.12	0.25	0.050	0.11	0.01	2.47	
6	1.5	0.225	0.14	0.25	0.056	0.17	0.01	4.29	
7	1.75	0.200	0.12	0.25	0.050	0.24	0.01	5.39	
8	2	0.300	0.18	0.25	0.08	0.21	0.02	7.07	
9	2.25	0.225	0.14	0.25	0.06	0.11	0.01	2.78	
10	2.5	0.225	0.14	0.25	0.06	0.02	0.00	0.50	
11	2.75	2.225	1.34	0.25	0.56	0.04	0.02	9.99	
12	3	0.150	0.09	0.25	0.04	0.01	0.00	0.17	
13	3.25	0.125	0.08	0.25	0.03	0.00	0.00	0.00	
14									
15									
16									
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19									
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29									
(End Point)	*3.5*	*0.000*	*0.00*	*0.13*	*0.00*	*0.00*	*0.00*	*0.00*	

Stream Cross-sectional Area (ft2)	1.2125	
Average Flow Velocity (ft/s)	0.07	
Total Discharge Rate	**0.077 cfs**	**34.45 gpm**

USER NOTES
1) Enter your data into the green columns below.
2) The other columns should calculate automatically
3) Sequentially fill Measurements # 0 (Initial Pt) thru 29 as available. Measurement #30 is always the End (last) Data Point. Do not add or remove rows without checking checking formulas for completeness and accuracy.

WARMHOUSE BEACH DUMP SITE
STREAM GAGE AREA-VELOCITY METHOD CALCULATION

Event No:	1
Stream ID:	West Creek 2
Location ID:	WC-06
Measurement Date/Time:	3/15/16 15:00

	X	D		W	A	V	Q		
Measurement #	Measured Distance from Initial Point (**X**) (ft)	Bed Depth Measurment (**D**) (ft)	Depth of Gage Observation from Surface (ft) 0.6 x **D**	Width of Interval (**W**) (ft)	Area of Interval (**A**) (ft2)	Point Velocity Measurement (**V**) (ft/s)	Interval Discharge Flow (**Q**) (ft3/s) **A** x **V**	Interval Discharge Flow (**Q**) (gpm) **A** x **V**	**Click here for Tip**
0 (Initial Point)	*0*	*0.100*	*0.06*	*0.13*	*0.013*	*0.75*	*0.01*	*4.21*	
1	0.25	0.150	0.09	0.25	0.038	0.64	0.02	10.77	
2	0.5	0.200	0.12	0.25	0.050	0.98	0.05	21.99	
3	0.75	0.250	0.15	0.25	0.063	0.92	0.06	25.81	
4	1	0.275	0.17	0.25	0.069	1.20	0.08	37.03	
5	1.25	0.250	0.15	0.25	0.063	1.09	0.07	30.58	
6	1.5	0.200	0.12	0.25	0.050	1.05	0.05	23.56	
7	1.75	0.075	0.05	0.25	0.019	0.95	0.02	7.99	
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29									
(End Point)	*2*	*0.000*	*0.00*	*0.13*	*0.00*	*0.00*	*0.00*	*0.00*	

Stream Cross-sectional Area (ft2)	0.3625	
Average Flow Velocity (ft/s)	0.84	
Total Discharge Rate	**0.361 cfs**	**161.94 gpm**

USER NOTES
1) Enter your data into the green columns below.
2) The other columns should calculate automatically
3) Sequentially fill Measurements # 0 (Initial Pt) thru 29 as available. Measurement #30 is always the End (last) Data Point. Do not add or remove rows without checking checking formulas for completeness and accuracy.

WARMHOUSE BEACH DUMP SITE
STREAM GAGE AREA-VELOCITY METHOD CALCULATION

Event No:	1
Stream ID:	East Creek 1
Location ID:	EC-01
Measurement Date/Time:	3/17/16 16:10

	X	D		W	A	V	Q		
Measurement #	Measured Distance from Initial Point (**X**) (ft)	Bed Depth Measurment (**D**) (ft)	Depth of Gage Observation from Surface (ft) 0.6 x **D**	Width of Interval (**W**) (ft)	Area of Interval (**A**) (ft2)	Point Velocity Measurement (**V**) (ft/s)	Interval Discharge Flow (**Q**) (ft3/s) **A** x **V**	Interval Discharge Flow (**Q**) (gpm) **A** x **V**	**Click here for Tip**
0 (Initial Point)	*0*	*0.000*	*0.00*	*0.13*	*0.000*	*0.00*	*0.00*	*0.00*	
1	0.25	0.100	0.06	0.25	0.025	0.00	0.00	0.00	
2	0.5	0.100	0.06	0.25	0.025	0.00	0.00	0.00	
3	0.75	0.100	0.06	0.25	0.025	0.00	0.00	0.00	
4	1	0.200	0.12	0.25	0.050	0.00	0.00	0.00	
5	1.25	0.250	0.15	0.25	0.063	0.00	0.00	0.00	
6	1.5	0.350	0.21	0.25	0.088	0.19	0.02	7.46	
7	1.75	0.300	0.18	0.25	0.075	0.62	0.05	20.87	
8	2	0.150	0.09	0.25	0.04	0.21	0.01	3.53	
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29									
(End Point)	*2.25*	*0.025*	*0.02*	*0.13*	*0.00*	*0.01*	*0.00*	*0.01*	

Stream Cross-sectional Area (ft2)	0.390625	
Average Flow Velocity (ft/s)	0.10	
Total Discharge Rate	**0.071 cfs**	**31.88 gpm**

USER NOTES
1) Enter your data into the green columns below.
2) The other columns should calculate automatically
3) Sequentially fill Measurements # 0 (Initial Pt) thru 29 as available. Measurement #30 is always the End (last) Data Point. Do not add or remove rows without checking checking formulas for completeness and accuracy.

WARMHOUSE BEACH DUMP SITE
STREAM GAGE AREA-VELOCITY METHOD CALCULATION

Event No:	1
Stream ID:	East Creek 2
Location ID:	EC-03
Measurement Date/Time:	3/16/16 11:20

	X	D		W	A	V	Q		
Measurement #	Measured Distance from Initial Point (**X**) (ft)	Bed Depth Measurment (**D**) (ft)	Depth of Gage Observation from Surface (ft) 0.6 x **D**	Width of Interval (**W**) (ft)	Area of Interval (**A**) (ft2)	Point Velocity Measurement (**V**) (ft/s)	Interval Discharge Flow (**Q**) (ft3/s) **A** x **V**	Interval Discharge Flow (**Q**) (gpm) **A** x **V**	**Click here for Tip**
0 (Initial Point)	*0.25*	*0.025*	*0.02*	*0.13*	*0.003*	*0.10*	*0.00*	*0.14*	
1	0.5	0.125	0.08	0.25	0.031	0.26	0.01	3.65	
2	0.75	0.150	0.09	0.25	0.038	0.50	0.02	8.42	
3	1	0.150	0.09	0.25	0.038	1.10	0.04	18.51	
4	1.25	0.150	0.09	0.25	0.038	0.85	0.03	14.31	
5	1.5	0.250	0.15	0.25	0.063	0.27	0.02	7.57	
6	1.75	0.100	0.06	0.25	0.025	0.15	0.00	1.68	
7	2	0.125	0.08	0.25	0.031	0.10	0.00	1.40	
8	2.25	0.100	0.06	0.25	0.03	0.14	0.00	1.57	
9	2.5	0.100	0.06	0.25	0.03	0.14	0.00	1.57	
10									
11									
12									
13									
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27									
28									
29									
(End Point)	*2.75*	*0.050*	*0.03*	*0.13*	*0.01*	*0.00*	*0.00*	*0.00*	

Stream Cross-sectional Area (ft2)	0.321875	
Average Flow Velocity (ft/s)	0.33	
Total Discharge Rate	**0.131** cfs	**58.82** gpm

USER NOTES
1) Enter your data into the green columns below.
2) The other columns should calculate automatically
3) Sequentially fill Measurements # 0 (Initial Pt) thru 29 as available. Measurement #30 is always the End (last) Data Point. Do not add or remove rows without checking checking formulas for completeness and accuracy.

WARMHOUSE BEACH DUMP SITE
STREAM GAGE AREA-VELOCITY METHOD CALCULATION

Event No:	1
Stream ID:	Unnamed Stream B1
Location ID:	USB-01
Measurement Date/Time:	3/19/16 15:35

	X	D		W	A	V	Q		
Measurement #	Measured Distance from Initial Point (**X**) (ft)	Bed Depth Measurment (**D**) (ft)	Depth of Gage Observation from Surface (ft) 0.6 x **D**	Width of Interval (**W**) (ft)	Area of Interval (**A**) (ft2)	Point Velocity Measurement (**V**) (ft/s)	Interval Discharge Flow (**Q**) (ft3/s) **A** x **V**	Interval Discharge Flow (**Q**) (gpm) **A** x **V**	**Click here for Tip**
0 (Initial Point)	*0*	*0.000*	*0.00*	*0.13*	*0.000*	*0.00*	*0.00*	*0.00*	
1	0.25	0.030	0.02	0.25	0.008	0.09	0.00	0.30	
2	0.5	0.125	0.08	0.25	0.031	0.46	0.01	6.45	
3									
4									
5									
6									
7									
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23									
24									
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26									
27									
28									
29									
(End Point)	*0.75*	*0.000*	*0.00*	*0.13*	*0.00*	*0.00*	*0.00*	*0.00*	

Stream Cross-sectional Area (ft2)	0.03875	
Average Flow Velocity (ft/s)	0.14	
Total Discharge Rate	**0.015** cfs	**6.75** gpm

USER NOTES
1) Enter your data into the green columns below.
2) The other columns should calculate automatically
3) Sequentially fill Measurements # 0 (Initial Pt) thru 29 as available. Measurement #30 is always the End (last) Data Point. Do not add or remove rows without checking checking formulas for completeness and accuracy.

WARMHOUSE BEACH DUMP SITE
STREAM GAGE AREA-VELOCITY METHOD CALCULATION

Event No:	1
Stream ID:	Unnamed Stream B1 - Duplicate
Location ID:	USB-01
Measurement Date/Time:	3/19/16 16:00

	X	D		W	A	V	Q		
Measurement #	Measured Distance from Initial Point (**X**) (ft)	Bed Depth Measurment (**D**) (ft)	Depth of Gage Observation from Surface (ft) 0.6 x **D**	Width of Interval (**W**) (ft)	Area of Interval (**A**) (ft2)	Point Velocity Measurement (**V**) (ft/s)	Interval Discharge Flow (**Q**) (ft3/s) **A** x **V**	Interval Discharge Flow (**Q**) (gpm) **A** x **V**	**Click here for Tip**
0 (Initial Point)	*0*	*0.000*	*0.00*	*0.13*	*0.000*	*0.00*	*0.00*	*0.00*	
1	0.25	0.025	0.02	0.25	0.006	0.03	0.00	0.08	
2	0.5	0.125	0.08	0.25	0.031	0.40	0.01	5.61	
3									
4									
5									
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22									
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24									
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27									
28									
29									
(End Point)	*0.75*	*0.000*	*0.00*	*0.13*	*0.00*	*0.00*	*0.00*	*0.00*	

Stream Cross-sectional Area (ft2)	0.0375	
Average Flow Velocity (ft/s)	0.11	
Total Discharge Rate	**0.013** cfs	**5.69** gpm

USER NOTES
1) Enter your data into the green columns below.
2) The other columns should calculate automatically
3) Sequentially fill Measurements # 0 (Initial Pt) thru 29 as available. Measurement #30 is always the End (last) Data Point. Do not add or remove rows without checking checking formulas for completeness and accuracy.

Appendix D
Event 1 Field Records

Field Sampling Forms

SURFACE WATER COLLECTION FIELD FORM

Project Name: Warmhouse Beach Dump Superfund Site
Project Number: 652441.F1.05
Date/Time: 03/15/16 1326
Sampler Names: K. Stevens
Weather: Low 40's, rain showers
Location ID: BKGD-01
Latitude/Longitude: TBD /
Sample ID: 2016WB1-SW-BKGD-01
Sample Equipment Used: Marsh-McBirney, MiniRae PID3000, Horiba U500, Sterile Syringes
Tidal Condition: Low tide
TRIMBLE GEOXH GPS # 1485K
Estimated Flow Rate: 1.6 cfs
Water Depth: 0.25 - 1 ft
Photograph No(s): 2002 - 2007 (NO WHITE BOARD IN PHOTOS)
Water Sample Description: Clear, low turbidity, no odor
Sample Analyses: VOCs, Total metals, dissolved (FF) metals, Perchlorate, SVOCs, Pesticides
Filters used: Dissolved metals - 0.45 micron filter, Perchlorate - 0.2 micron PTFE filter

No. of Sample Containers: 12
Field Parameters: Conductivity 0.078 mS/cm pH 5.52
Temp. 8.23°C DO 14.57 mg/L
Comments: Background sample @ Classet Creek. Trimble GPS could not locate more than 2 satellites, area was mark with flagging.

Deviations from Sampling Plan: NONE - NO GPS SATELLITES

FTL Signature: Mark Ed
Date/Time: 03/16/2015 20:00

SURFACE WATER COLLECTION FIELD FORM

Project Name: Warmhouse Beach Dump Project Number: 652441.F1.05

Date/Time: 03/15/16 ~~1545~~ 1430 Sampler Names: K. Stevens

Weather: Low 40's, rain showers

Location ID WC-06 Latitude/Longitude: 48.389338 / -124.66083

Sample ID 2016WB1-SW-WC-06

Sample Equipment Used: MARSH - MCBIRNEY, PID 3000 MINIRAE, HORIBA U-50, STERILE SYRINGES

Tidal Condition: UP TO ~5' WAVES, LOW RISING TIDE TRIMBLE GEOXH GPS #14818

Estimated Flow Rate: 0.14 cfs

Water Depth: ~~0.75~~ 0.075 - 0.275 ft

Photograph No(s): ~~2013 - 2015~~ 2008, 2012, 2011 (see whiteboard in photos)

Water Sample Description: CLEAR, LOW TURBIDITY, NO ODOR

Sample Analyses: VOCs, TOTAL METALS, DISSOLVED (FF) METALS, PERCLORATE, SVOCs, PESTICIDES

Filters used: PERCLORATE = 0.2 micron PTFE FILTER, DISSOLVED METALS = 0.45 micron FILTER

No. of Sample Containers: 36

Field Parameters: Conductivity 0.192 mS/cm pH 6.48

Temp. 8.88°C DO 11.05 mg/L

Comments: MS/MSD taken same analyses as Parent

Deviations from Sampling Plan: GPS TRIMBLE DID NOT LOCK ON ENOUGH SATELITES TO GET XY LOCATION READINGS. OTHERWISE NONE

FTL Signature: [signature] Date/Time: 03/16/2016 20:00

SURFACE WATER COLLECTION FIELD FORM

Project Name: Warmhouse Beach Dump Project Number: 652441.F1.05

Date/Time: 03/15/16 1540 Sampler Names: K. Stevens

Weather: Low 40's, rain showers

Location ID US-01 Latitude/Longitude: 48.390131, -124.660843

Sample ID 2016WB1-SW-US-01

Sample Equipment Used: Marsh-McBirney, MiniRae PID 3000, HORIBA U-500, Sterile Syringes

Tidal Condition: Low tide TRIMBLE GEO XH GPS # 14816

Estimated Flow Rate: ~~0.044 cfs~~ 0.04 cfs

Water Depth: ~~0.64 ft~~ 0.064 ft

Photograph No(s): ~~2008 - 2012~~ 2013 - 2015 (NO WHITEBOARD IN PHOTOS)

Water Sample Description: Clear, low turbidity, no odor

Sample Analyses: VOCs, total metals, dissolved (SF) metals, Perchlorate, SVOCs, pesticides

Filters used: Dissolved metals - 0.45 micron filter, Perchlorate - 0.2 micron PTFE filter

No. of Sample Containers: 12

Field Parameters: Conductivity 0.121 mS/cm pH 6.70

Temp. 8.61°C DO 10.15 mg/L

Comments: GPS could not locate enough satellites, site was marked with flagging.

Deviations from Sampling Plan: US01 instead of US02. (GPS LOCATION CHANGE) OTHERWISE NONE

FTL Signature: Mark Ewl Date/Time: 03/16/2016 20:00

SURFACE WATER COLLECTION FIELD FORM

Project Name: WAREHOUSE BEACH DUMP SITE Project Number: 652441.FI.05

Date/Time: 03/16/2016 ~~10:45~~ 11:15 (N) Sampler Names: MENDY, J. KNUTH, K. STEVENS

Weather: PARTLY CLOUDY, LOW 50'S°F

Location ID EC-03 Latitude/Longitude: NO GPS /

Sample ID 2016WB1-SW-EC-03

Sample Equipment Used: HORIBA U-53, GRAB SAMPLES: 60mL SIZED SYRINGE, 0.2 PTFE

Tidal Condition: NA TRIMBLE GEOXH GPS # 14818

Estimated Flow Rate: 0.3 Ft/s ~~cfs~~ (E)

Water Depth: 4 IN ~~ft~~ (m)

Photograph No(s): 2016

Water Sample Description: CLEAR, NO ODOR, NO PARTICULATES

Sample Analyses: TVOA TCL + VOC SIM MA 2454.2, TOTAL METALS TAL: ICPMS, ICPAES, Hg

DISSOLVED METALS TAL: ICPMS, ICPAES, Hg (FF), PESTICIDES TCL, PERCHLORATES,

SVOC TCL + PAH SIM.

Filters used: 0.2um PTFE, STERILE, HYDROPHILIC, 0.45μm FILTER

No. of Sample Containers: 12

Field Parameters: Conductivity 0.261 mS/cm pH 6.10 ORP = 242mV

Temp. 8.39 °C DO 10.15 mg/L TURB = 4.48 NTU

Comments: C STREAM BED ~ 2.5FT BELOW FOREST FLOOR, GOOD FLOW, RIPARIAN

Deviations from Sampling Plan: NONE, GPS NOT RECEIVING SATELLITES.

FTL Signature: Mark Er Date/Time: 03/16/2016 11:45

SURFACE WATER COLLECTION FIELD FORM

Project Name: WARMHOUSE BEACH DUMPSITE Project Number: 652441.F1.05

Date/Time: 3/16/16 12:30 Sampler Names: M. ENDO, K. STEVENS, J. SMITH

Weather: PARTLY CLOUDY, 40-50°F

Location ID EC-02 Latitude/Longitude: NO GPS /

Sample ID 2016WB1-SW-EC-02 12:30
EC-902 12:45

Sample Equipment Used: SYRINGE + FILTERS, HORIBA U-53, TRIMBLE GEOXH GPS # 14618

Tidal Condition: NA

Estimated Flow Rate: 0.3 Ft/s ~~cfs~~ @

Water Depth: 0-0.25 ft

Photograph No(s): 2020, 2021 (NO SHORELINE IN 2021)

Water Sample Description: CLEAR, LOW TURBIDITY, NO ODOR

Sample Analyses: VOC, SVOC, Perclorate, Total Metals, Dissolved Metals, PESTICIDES

Filters used: 0.2 micron PTFE, 0.45 micron

No. of Sample Containers: 12 x 2 = 24 TODAY INCLUDING DUP.

Field Parameters: Conductivity 0.259 mS/cm pH 6.41 ORP = 225 mV

Temp. 8.24 °C DO 10.04 mg/L TURB = 4.52 NTU

Comments: GOOD FLOW, RIPARIAN STREAM BED BOTTOM OF MODERATE SLOPED RAVINE.

Deviations from Sampling Plan: NONE - GPS NOT RECEIVING SATELLITES

FTL Signature: Mark Endo Date/Time: 03/16/2016 13:20

SURFACE WATER COLLECTION FIELD FORM

Project Name: WBD

Project Number: 652441.F1.05

Date/Time: 03/16/16 1515

Sampler Names: K. Stevens / J. Knuth / M. Endo

Weather: 40's Calm, Sunny

Location ID: KC01

Latitude/Longitude: No GPS /

Sample ID: 2016WB1-SW-KC-01

Sample Equipment Used: Horiba-U5000, Sterile syringes, Trimble Geoxh GPS #14B1E

Tidal Condition: Low tide

Estimated Flow Rate: 1.0 cfs

Water Depth: ~7 in ft

Photograph No(s): 2022, 2023, 2024

Water Sample Description: Crystal clear, No odor, Mineral white particulates

Sample Analyses: VOCs, Dissolved metals, total metals, perchlorate, SVOCs, Pesticides

Filters used: .2 micron filter, .45 micron filter

No. of Sample Containers: 12

Field Parameters: Conductivity 0.054 mS/cm pH 6.06

Temp. 7.74°C DO 10.72 mg/L

Comments: ORP: 224 mV 2.54 NTU = Turb.

Deviations from Sampling Plan: None - GPS not receiving satellites

FTL Signature: Mark Ek

Date/Time: 03/16/2016 15:30

SURFACE WATER COLLECTION FIELD FORM

Project Name: WAREHOUSE BEACH DUMP SITE Project Number: 652441.F1.05

Date/Time: 3/16/16 1600 Sampler Names: K. Stevens / J. Knuth / M. Endo

Weather: MOSTLY SUNNY, MID 50'S °F

Location ID: KC02 Latitude/Longitude: /

Sample ID: 2016WB1-SW-KC-02 No SATELLITES

Sample Equipment Used: HORIBA U-52, 60mL STERILE SYRINGE, TRIMBLE GEOXH GPS # 14E1E

Tidal Condition: Low tide.

Estimated Flow Rate: 2.5 cfs

Water Depth: 4" ft IN

Photograph No(s): 2025

Water Sample Description: CLEAR, NO ODOR, MINOR SILT PARTICULATES.

Sample Analyses: VOCs, TOTAL METALS TAL, DISSOLVED METALS TAL (FF), PESTICIDES, PERCHLORATES, SVOCs

Filters used: 0.2µm PTFE, STERILE, HYDROPHILIC ; 0.45µm FILTER

No. of Sample Containers: 12

Field Parameters : Conductivity 0.054 mS/cm pH 5.99

Temp. 7.77 °C DO 10.74 mg/L

Comments: IN BOTTOM OF STEEP RAVINE ~ 200-300 FT UPSTREAM OF BEACH. ORP = 2.41 mV, TURB = 2.06 NTU

Deviations from Sampling Plan: NONE - NO GPS SATELLITES

FTL Signature: Mark Endo Date/Time: 03/16/2016 16:30

SURFACE WATER COLLECTION FIELD FORM

Project Name: WARMHOUSE BEACH DUMP SITE Project Number: 652441.F1.05

Date/Time: 03/17/16 14:40 Sampler Names: M.ENDO, J. KNUTH, K. STEVENS

Weather: MOSTLY SUNNY, MID 50'S-F

Location ID: BKGD-06 Latitude/Longitude: NO GPS /

Sample ID: 2016WB2-SW-BKGD-06

Sample Equipment Used: HORIBA U-52, 60mL SYRINGE PINE: CONTROLLER # 15265, SENSOR # 21230

Tidal Condition: NA TRIMBLE GEOXH GPS # 14818

Estimated Flow Rate: 1.8 cfs

Water Depth: 8" ft(m)

Photograph No(s): 2027

Water Sample Description: CRYSTAL CLEAR

Sample Analyses: VOCs, SVOCs, PESTICIDES, PERCHLORATES, TAL METALS, TAL DISSOLVED (FF)

Filters used: 0.2 MM PTFE, STERILE, HYDROPHILIC FILTER, 0.45 MM FILTER

No. of Sample Containers: 12

Field Parameters: Conductivity 0.047 mS/cm pH 5.73 ORP = 220 mV

Temp. 7.54 °C DO 10.44 mg/L TURB = 0.0 NTU

Comments: RELATIVELY STEEP SLOPE TO POSITION, MARKED W/ PINK FLAGGING (LABELED) RIPARIAN FIELD OVER SUB ANGULAR RIVER ROCK AND DEBRIS (WOOD). SAMPLED IN FLOWING POOL. AFTER SAMPLING - SAMPLE LOCATION DEBRIS BLOCKED SAMPLE POINT CLEARED ALLOWING GREATER FLOW

Deviations from Sampling Plan: NO GPS SATELLITES - OTHERWISE NONE

FTL Signature: Mark Ci Date/Time: 03/17/2016 15:05

SURFACE WATER COLLECTION FIELD FORM

Project Name: Warehouse Beach Dump Project Number: 652441.F1.05

Date/Time: 03/17/16 1545 Sampler Names: K. Stevens / J Knuth / M. Endo

Weather: Mid 40's, Sunny, Windy

Location ID EC01 Latitude/Longitude: NO GPS /

Sample ID 2016WBI-SW-EC01

Sample Equipment Used: Horiba, Syringes PINE ENVIR: CONTROLLER # 15265 SENSOR # 21238 TRIMBLE GPS # 14816

Tidal Condition: NA

Estimated Flow Rate: 0.4 cfs

Water Depth: 0.5 ft

Photograph No(s): ~~2028~~ 2029 2030

Water Sample Description: low turbidity, NO odor, minimal particals

Sample Analyses: VOCs, total metals, dissolved metals, Perchlorates, SVOCs, Pesticides. DISSOLVED METALS (FF).

Filters used: .2 micron filters, .45 micron filters

No. of Sample Containers: 12

Field Parameters : Conductivity 0.316 mS/cm pH 6.78

Temp. 8.66°C DO 5.21 mg/L

Comments: Found old PA flag next to stream marked "08 125ft" ORP-194 mV, Turb 0.0 NTU. Stream gage location East Creek 1 in same location as EC-01.

Deviations from Sampling Plan: NO GPS SATELLITES. OTHERWISE NONE

FTL Signature: Mark Endo Date/Time: 03/17/2016 16:10

SURFACE WATER COLLECTION FIELD FORM

Project Name: WARM HOUSE BEACH DUMP SITE Project Number: 652441.F1.05

Date/Time: 3/18/16 12:30 Sampler Names: K. STEVEN + J. KNUTH

Weather: Overcast, 40-50°F, E WINDS @ 8-15mph

Location ID WC Ø4 Latitude/Longitude: NO SATELLITES /

Sample ID 2016 (QA) WB1-SW-WC-Ø4

Sample Equipment Used: HORIBA U-500 Serial # 15265, SONDE # 21286

Tidal Condition: N/A CANNOT SEE OCEAN TRIMBLE GPS # 14518

Estimated Flow Rate: 1.0 cfs

Water Depth: 0.5 ft

Photograph No(s): # 2030, 2031, 2032

Water Sample Description: ~~CE~~* Clear, very low turbidity, colorless, No odor

Sample Analyses: VOC, SVOC, PESTICIDES, Perchlorate, T. metals, Diss. metals (FF)

Filters used: 0.2 micron PTFE, 0.45 micron

No. of Sample Containers: 12

Field Parameters: Conductivity 0.275 mS/cm pH 6.39

Temp. 8.35 °C DO 7.09 mg/L

Comments: Collected sample in deep pool under downed tree log over stream. Location ~150 ft down stream of stream gage Station / Location, ORP = 204 ~~mS/cm~~ mV, TURB = 1.9 NTU, TDS = 0.179 g/L

Deviations from Sampling Plan: NO GPS SATELLITES, OTHERWISE NONE

FTL Signature: Mark Enk Date/Time: 03/18/16 18:45

SURFACE WATER COLLECTION FIELD FORM

Project Name: WARMHOUSE BEACH DUMP SITE Project Number: 652441.01.05

Date/Time: 3/18/16 13:30 Sampler Names: K. STEVENS / J. KNUTH

Weather: OVERCAST, 40-50° F, E WINDS @ 8-15 mph

Location ID: WC-03 Latitude/Longitude: NO SATELLITES /

Sample ID: 2016WB1-SW-WC-03

Sample Equipment Used: HORIBA U-500 SERIAL # 15265, SONDE # 21280 TRIMBLE GPS #14818

Tidal Condition: N/A CANNOT SEE OCEAN

Estimated Flow Rate: 1.0 cfs

Water Depth: 0.5 ft

Photograph No(s): #2035, 2036

Water Sample Description: CLEAR, LOW TURBIDITY, COLORLESS, ODORLESS

Sample Analyses: VOC, SVOC, PESTICIDES, PERCHLORATE, TOTAL METALS, DISSOLVED METALS (FF)

Filters used: 0.2 MICRON PTFE, 0.45 MICRON NYLON

No. of Sample Containers: 12

Field Parameters: Conductivity 0.293 mS/cm pH 6.70

Temp. 8.96 °C DO 5.02 mg/L

Comments: SAMPLED WC03 ~ 30 FT UPSTREAM OF STREAM GAGE LOCATION AND ~30 FT DOWNSTREAM OF SEEP (SP-04). TURBIDITY = 4.4 NTU, ORP = 193 mV ~~mS/cm~~

Deviations from Sampling Plan: NO GPS SATELLITES - OTHERWISE NONE

FTL Signature: Mark Grant Date/Time: 03/18/16 18:46

SURFACE WATER COLLECTION FIELD FORM

Project Name: WARMHOUSE BEACH / DUMP SITE Project Number: 652441.F1.05

Date/Time: 3/18/16 16:00 Sampler Names: K. STEVENS / J. KNUTH

Weather: PARTLY CLOUDY, 40–50°F, E WINDS @ 8-15 mph

Location ID: WC-01 Latitude/Longitude: NO SATELLITES /

Sample ID: 2016WB1-SW-WC-01

Sample Equipment Used: HORIBA U-500 #15265, SONDE # 21280

Tidal Condition: N/A TRIMBLE GEO XH GPS #14818

Estimated Flow Rate: 0.3 cfs

Water Depth: 0.4 ft

Photograph No(s): 2044, 2045, 2046

Water Sample Description: CLEAR, SLIGHTY TURBID, AND ODOR

Sample Analyses: VOC, SVOC, PESTICIDES, PERCHLORATE, TOTAL METALS, DISSOLVED METALS (FF)

Filters used: ~~0.45~~ 0.2 MICRON PTFE, 0.45 MICRON NYLON

No. of Sample Containers: 12

Field Parameters: Conductivity 0.367 mS/cm pH 6.83 TURB = 31.6 NTU

Temp. 9.39 °C DO 10.51 mg/L ORP = 100 mV

Comments: STREAM SEDIMENT HAVE AN RUSTY ORANGE COLOR. LOTS OF REFUSE DEBRIS IN STREAM AND ON BANKS. WC 01 SAMPLE LOCATION DOWNSTREAM ~ 25 FT FROM SEEP (SP-03)

Deviations from Sampling Plan: NO GPS SATELLITES, OTHERWISE NONE

FTL Signature: Mark Curtis Date/Time: 03/18/16 06:50

SURFACE WATER COLLECTION FIELD FORM

Project Name: SE WEST WARM HOUSE BEACH DUMP SITE

Project Number: 652441.F1.04

Date/Time: 3/19/16 10:10

Sampler Names: K. STEVENS / J. KNUTH

Weather: CLOUDY, SCATTERED SHOWERS, 40-50°F

Location ID: WC02

Latitude/Longitude: NA /

Sample ID: 2016WBI-SW-WC-02

Sample Equipment Used: HORIBA U-300 #15265, SONDE # 21280, TRIMBLE GEOXH GPS # 14818

Tidal Condition: N/A

Estimated Flow Rate: 0.3 cfs

Water Depth: 0.33 ft

Photograph No(s): 2047, 2048

Water Sample Description: CLEAR, COLORLESS, MINIMAL TURBIDITY, NO ODOR

Sample Analyses: VOC, SVOC, PESTICIDES, PERCHLORATE, TOTAL METALS, DISSOLVED METALS (FF)

Filters used: 0.2 MICRON PTFE, 0.45 MICRON NYLON

No. of Sample Containers: 12

Field Parameters: Conductivity 0.306 mS/cm pH 6.34 TURB = 0.6 NTU

Temp. 9.32°C DO 6.69 mg/L ORP = 172 mV

Comments: WC02 LOCATED HALF WAY BETWEEN WC01 + WC03. ~100FT FROM WC01 + WC03. ON WEST CREEK. NO GPS RECEPTION UNDER THICK TREE COVER.

Deviations from Sampling Plan: NO GPS SATELLITES - OTHERWISE NONE.

FTL Signature: Mark Ell Date/Time: 03/19/2016 21:00

SEEP WATER COLLECTION FIELD FORM

Project Name: Warmhouse Beach Dump Site Project Number: 652441.F1.05

Date/Time: 3/9/16 1115 Sampler Names: K. Stevens / J. Kinuth

Weather: Low 50's, ~~clear~~ *kis, calm, overcast

Seep ID SP-09 Latitude/Longitude: NA /

Sample ID 2016WB1-SW-SP-04 TRIMBLE GEOXH GPS # 14818

Sample Equipment Used: Sterile syringes, HORIBA U-500 #15265, MINI RAE 3000 PID #21266

Water Depth: 0.25 ft Estimated Flow: < 0.05 cfs

Photograph No(s): 2049

Water Sample Description: CLEAR, HIGH TURBIDITY, NO ODOR, COLORLESS

Sample Analyses: VOCs, tal. metals, dissolved (FF) metals, perchlorates, SVOCs, Pesticides

Filters used: 0.2 micron PTFE, 0.45 micron

No. of Sample Containers: 12

Field Parameters: Conductivity 0.224 mS/cm pH 5.75 TURB = 170 NTU

Temp. 9.89 °C DO ~~0.00~~ 1.67 mg/L ORP = 189 mV

Comments: PID reading: 0.0 ppm, SLIGHTY ~~OR~~ NATURALLY ORGANIC SHEEN OBSERVED ON POOL SURFACE. BROKE APART WHEN SWIRLED.

DEVIATIONS FROM FSP: SHEET FLOW FROM HILLSIDE. HAD TO EXCAVATE A SMALL POOL WITH STICK TO COLLECT SEEP FLOW FROM POOL WALLS. ALLOW TO SETTLE SEDIMENT FOR 10-15 MINS BEFORE SAMPLING. 60 mL STERILE SYRINGE WAS UTILIZED TO TRANSFER WATER FROM POOL TO ALL BOTTLEWARE.

~~Deviations from FSP:~~

FTL Signature: Mark Ent Date/Time: 03/19/16 21:18

CH2MHILL

SURFACE WATER COLLECTION FIELD FORM

Project Name: WARMHOUSE BEACH DUMP SITE

Project Number: 652441.F1.05

Date/Time: 3/19/16 12:30

Sampler Names: K. STEVENS, J. KNUTH

Weather: OVERCAST, ~50°F

Location ID: WC05

Latitude/Longitude: NA /

Sample ID: 2016WBI-SW-WC-05

Sample Equipment Used: HORIBA U-500 #15265 #21266, TRIMBLE GEOXH #14818

Tidal Condition: N/A

Estimated Flow Rate: 0.5 cfs

Water Depth: 0.5 ft

Photograph No(s): 2050, 2051

Water Sample Description: CLEAR, COLORLESS SLIGHT TURBIDITY, NO ODOR

Sample Analyses: VOC, SVOC, PESTICIDES, PERCHLORATE, TOTAL METALS, DISS. METALS (FF)

Filters used: 0.2 MICRON PTFE, 0.45 MICRON NYLON

No. of Sample Containers: 12

Field Parameters: Conductivity 0.228 mS/cm pH 6.77 TURB = 3.8 NTU

Temp. 9.03 °C DO 5.83 mg/L ORP = 150 mV

Comments: DUPLICATE PARAMETERS PAR COND = 0.229 mS/cm TEMP = 9.02 °C, PH = 6.84, ORP = 147 mV DO = 5.99 mg/L, TURB = 3.5 NTU. COLLECTED WC05 IN FERN COVERED RAVINE.

Deviations from Sampling Plan: NO GPS SATELLITES. OTHERWISE NONE.

FTL Signature: Mark Ewl

Date/Time: 03/19/2016 11:00

SURFACE WATER COLLECTION FIELD FORM

Project Name: WBD

Project Number: 652441-F1.05

Date/Time: 3/19/16 1500

Sampler Names: K. Stevens / J. Knuth

Weather: Low 50's, overcast

Location ID: USB-01

Latitude/Longitude: NA /

Sample ID: 20160WBI-SW-USB-01

Sample Equipment Used: Horiba U5000 #15265, #21266, STERILE SYRINGE

Tidal Condition: High Tide

Estimated Flow Rate: <0.1 cfs

Water Depth: 0.1 ft

Photograph No(s): 20.55

Water Sample Description: Clear, no odor, no color

Sample Analyses: VOC, tal. metals, diss. (FF) metals, perchlorate, SVOC, Pesticides

Filters used: 0.2 micron, PTFE. 0.45 micron

No. of Sample Containers: 12

Field Parameters: Conductivity 0.118 mS/cm pH 7.16 Turb: 4.0 NTU

Temp. 9.57°C DO 8.71 mg/L ORP 134 mV

Comments: Temp: 9.31°C pH: 7.12 ORP: 140 mV Cond: 0.117 mS/cm Turb: 2.4 NTU DO: 6.31 mg/L - FD parameters. Sampled stream from aprox. 10 inch waterfall. Collect stream gage + FD from "Unnamed Stream B."

Deviations from Sampling Plan: Unable to use GPS not enough satellites. - OTHER WISE NONE

FTL Signature: Mal Cal

Date/Time: 03/19/2016 21:15

SURFACE WATER COLLECTION FIELD FORM

Project Name: WAREHOUSE BEACH PUMP SITE Project Number: 652441.01.05

Date/Time: 03/A/2016 ~~15:00 EP~~ 15:00 ~~1520S~~ Sampler Names: M. ENDO

Weather: CLOUDY, LOW 50'S °F, E WINDS @ 2-3mph

Location ID US-02 Latitude/Longitude: ~~NO GPS AVAILABLE~~ (EP) NA

Sample ID 2016WBZ-SW-US-02

Sample Equipment Used: HORIBA U-53 (#15265, # 21206), STERILE 60mL SYRINGE

Tidal Condition: N/A.

Estimated Flow Rate: ~~0.2~~ (EP) cfs 4.1 CFS

Water Depth: 2" ~~H(S)~~

Photograph No(s): ~~2058~~ (ME) 2060

Water Sample Description: MOSTLY CLEAR, NO ODOR

Sample Analyses: VOSs, SVOCs, PESTICIDES, PERCHLORATE, TOTAL METALS TAL, ~~TOTAL~~ (AL) DISSOLVED METALS TAL (FF)

Filters used: 0.2 µm PTFE, STERILE, HYDROPHILIC, 0.45µm

No. of Sample Containers: 12

* Field Parameters: Conductivity 0.247 mS/cm pH 6.6 ORP = 160 mV

Temp. 10.02 °C DO 5.58 mg/L TURB = 3.6 NTU

Comments: SAMPLE LOCATION @ THE TOE OF SLOPE, VERY SMALL, SLOW RUNNING CREEK WITH MODERATE WILLOW VEGETATION GROWTH. ~~ALL BOTTLES FILLED W/ 60ML STERILE SYRINGE.~~ ~~SMALL POOL W/ RUNNING WATER~~ WATER (AL)

* PARAMETERS TAKEN @ 1745 WHEN METER BECAME AVAILABLE. (AL)

Deviations from Sampling Plan: NO GPS SATELLITES ~~OTHERWISE NOPE~~ (ME) ALL BOTTLEWARE FILLED W/ 60mL STERILE SYRINGE FROM SMALL POOL IN CREEK W/ RUNNING WATER BESIDES VOCs. TWO SYRINGES WERE UTILIZED FOR FILTERED SAMPLES, ONE TO FILTER WATER AND ONE TO FILL THE FIRST SYRINGE.

FTL Signature: Mark Enc Date/Time: 03/19/2016 18:00

SEEP WATER COLLECTION FIELD FORM

Project Name: WARMHOUSE BEACH DUMP SITE Project Number: 652441.F1.05

Date/Time: 03/19/2016 1635 Sampler Names: M. ENDO, J. KNUTH, K. STEVENS

Weather: CLOUDY, UPPER 40'S °F, ENE WIND @ 3-5mph

Seep ID SP-05 Latitude/Longitude: NO GPS SATELLITES /

Sample ID 2016WB1-SW-SP-05

Sample Equipment Used: HORIBA U53, PID MINIRAE3000, STERILE 60mL SYRINGE (#15265, #21256)

Water Depth: 1.5" ft (3) Estimated Flow: ~40 mL/min gfs (2)

Photograph No(s): 2058

Water Sample Description: VERY SLIGHT CLOUDINESS, TRANSPARENT, NO ODOR

Sample Analyses: VOCs, SVOCs, PERCHLORATES, PESTICIDES, SVOCs, TOTAL METALS TAL, DISSOLVED METALS TAL (FF)

Filters used: @ 0.2mm STERILE, PTFE, HYDROPHILIC, 0.45 mm

No. of Sample Containers: 12

Field Parameters: Conductivity 0.253 mS/cm pH 6.31 ORP: 173 mV

PID = 0.0 ppm (WATER SLIGHTLY SEEPS IN FROM SIDEWALL) (AS) Temp. 9.81 °C DO 4.54 mg/L Turb: 5.9 NTU

Comments: SMALL STANDING POOL (~1 FT DIAMETER) AT TOE OF SLOPE, UPHILL FROM SUPPOSED UNNAMED STREAM HEADWATER. RECHARGE RATE ~40 mL/min. LAST THREE BOTTLES (1L AMBERS) SLIGHTLY MORE TURBID THEN REMAINDER OF SAMPLES DUE TO DISTURBANCE. ~~USED STERILE SYRINGES TO FILL BOTTLEWARE~~ (ML)

Deviations from FSP: NO GPS SATELLITES AVAILABLE, ~~OTHERWISE NONE~~ (2) ALL BOTTLEWARE FILLED W/ 60mL STERILE SYRINGE FROM SMALL POOL, BESIDES VOCs. TWO SYRINGES WERE UTILIZED FOR FILTERED SAMPLES, ONE TO FILTER WATER AND ONE TO FILL THE FIRST SYRINGE.

FTL Signature: Mark Endo Date/Time: 03/19/2016 18:18

CH2MHILL

SEEP WATER COLLECTION FIELD FORM

Project Name: WBD - WAREHOUSE BEACH DUMP SITE Project Number: 652441.F1.05

Date/Time: 3/20/16 1800 Sampler Names: K. Stevens / J. Kiauth

Weather: High 40's, Overcast

Seep ID SP03 + SP-903 Latitude/Longitude: NA /

Sample ID 2016WBI-SW-SP03 + 2016WBI-SW-SP-903

Sample Equipment Used: Horiba U500, PID MINIRAE 3000, 60mL STERILE SYRINGE, GPS #14816 TRIMBLE GEO XT

Water Depth: 0.03 ft Estimated Flow: 225 ml @ 20 SECS cfs = 3.97×10^{-4} cfs

Photograph No(s): 2061, 2062 (WHITE BOARD SAYS "2061" FOR ALL PHOTOS)

Water Sample Description: Slight orange color - clear, small 1mm orang particle, no odor

Sample Analyses: VOCs, Tal metals, diss (FF) metals, Perchlorates, SVOCs, Pesticides,

Filters used: .2 micron filters 0.45 micron filters

No. of Sample Containers: 12 +12(FD)

Field Parameters: Conductivity 0.501 mS/cm pH 6.54 orp: 133 mV

Temp. 10.51 °C DO 8.52 mg/L Turb: 3.4 NTU

Comments: Field duplicate 2016WBI-SW-SP903 @ 1030. Field dup. parameters: Cond: 0.485 mS/cm, Temp: 10.25°C, pH: 6.77, ORP: 110 mV Turb: 1.2 NTU DO: 0.0 mg/L. PID reading: 0.1ppm

Deviations from FSP: NO GPS satellites - NO OTHER DEVIATIONS

FTL Signature: Mark Cant Date/Time: 03/21/16 20:30

CH2MHILL

SURFACE WATER COLLECTION FIELD FORM

Project Name: WBD - WAREHOUSE BEACH DUMP SITE Project Number: 652441.F1.05

Date/Time: 3/20/16 1245 Sampler Names: K Stevens / J Knuth

Weather: High 40's, overcast, mild scattered showers

Location ID BKGD-07 Latitude/Longitude: NA /

Sample ID ~~BKGD~~ 2016WB1-SW-BKGD-07

Sample Equipment Used: Horiba U5000, 60mL STERILE SYRINGE, TRIMBLE GeoXH GPS #14818

Tidal Condition: NA

Estimated Flow Rate: 0.3 cfs

Water Depth: 0.6 ft

Photograph No(s): 20603-20605 (WHITE BOARD IN ALL THREE PICTURES SAYS "2063")

Water Sample Description: Slightly brown, low turbidity, no odor

Sample Analyses: VOCs, Tal metals, dissolved (FP) metals, perchlorates, SVOCs, Pesticides.

Filters used: 0.2 micron PTFE, 0.45 micron

No. of Sample Containers: 36

Field Parameters: Conductivity 0.059 mS/cm pH 6.49 ORP: 137 mV

Temp. 8.30°C DO ~~3.72~~ 3.72 mg/L Turb: 9.5 NTU

Comments: Collect MS/SD. SMALL LOW FLOWING STREAM, ROOTS RUNNING THROUGH STREAM. COLLECTED SAMPLE IN SMALL POOL WITH MODERATE FLOW.

Deviations from Sampling Plan: Unable to aquire enough GPS satellites to collect data. NO OTHER DEVIATIONS

FTL Signature: Mark Carl Date/Time: 03/21/2016 08:38

SURFACE WATER COLLECTION FIELD FORM

Project Name: WBD - WAREHOUSE BEACH DUMP SITE Project Number: 652441.F1.05

Date/Time: 3/20/16 1440 Sampler Names: K. Stevens / J. Knuth

Weather: Mid 40's, rain

Location ID BKGD-09 Latitude/Longitude: NA /

Sample ID 2016WBI-SW-BKGD-09

Sample Equipment Used: Horiba U-500, 60mL Syringes (Sterile), Trimble GeoXH #14818

Tidal Condition: NA

Estimated Flow Rate: 0.2 cfs

Water Depth: 0.25 ft

Photograph No(s): 2066

Water Sample Description: Slightly yellow, no odor, low turbidity

Sample Analyses: VOCs, Tal metals, dissolved (FF) metals, perchlorates, SVOCs, pesticides.

Filters used: 0.2µm Sterile, PTFE, Hydrophilic, 0.45µm

No. of Sample Containers: 12

Field Parameters: Conductivity 0.045 mS/cm pH 5.87 ORP: 167 mV

Temp. 8.42°C DO 3.52 mg/L ~~Turb~~ Turbi: 27.6 NTU

Comments: LITTLE TO NO ~~No~~ VISIBLE FLOWING WATER, MODERATE TO SMALL TURBID POOL WITH WOODY DEBRIS & DECAY ORGANIC MATTER.

Deviations from Sampling Plan: Unable to access GPS Satellites. No other deviations.

FTL Signature: Mark Ewl Date/Time: 03/21/2016 20:35

SURFACE WATER COLLECTION FIELD FORM

Project Name: WARM HOUSE BEACH DUMP SITE Project Number: 652441.F1.05

Date/Time: 3/20/16 1530 Sampler Names: K. STEVENS + J. CAMPBELL

Weather: LIGHT RAIN, MID 40°F

Location ID BKGD-08 Latitude/Longitude: NA /

Sample ID 2016WBF-SW-BKGD-08

Sample Equipment Used: HORIBA U-52/53, ~~PID MINIRAE 3000~~, DIGITAL CAMERA, TRIMBLE GPS #1461A

Tidal Condition: N/A

Estimated Flow Rate: NONE cfs - STANDING POOL/POND

Water Depth: 0.4 ft

Photograph No(s): 2068

Water Sample Description: SLIGHTLY TURBIDITY, CLEAR, FAINT LIGHT BROWN COLOR, NO ODOR

Sample Analyses: VOC, SVOC, PESTICIDES, PERCHLORATE, TOPAC METALS, DISSOLVED METALS (FF)

Filters used: 0.2 MICRON PTFE, 0.45 MICRON NYLON

No. of Sample Containers: 12

Field Parameters: Conductivity ~~0.057~~ 0.057 mS/cm pH ~~S.~~ 5.58 TURB = 31.5 NTU

Temp. 7.86°C DO 0.00 mg/L ~~COR~~ ORP = 96 mV

Comments: 40 FT DIAMETER POND WITH NO CLEAR INLET OR OUTLET OBSERVED. WATER LOOKS STAGNANT.

Deviations from Sampling Plan: NO GPS ~~SATELLITES~~ SATELLITES - NO OTHER DEVIATIONS.

FTL Signature: Mark Ard Date/Time: 03/21/2016 21:00

SEEP WATER COLLECTION FIELD FORM

Project Name: WBD1 WAREHOUSE BEACH (ME) DUMP SITE Project Number: 652441.F1.05 (KEO)

Date/Time: 3/21/16 1325 Sampler Names: K. Stevens, S. Knuth

Weather: Mid 40's, rain

Seep ID SP-02 Latitude/Longitude: NA (MG) /

Sample ID 2016WBI-SW-SP-02

Sample Equipment Used: Horiba U50 (AA), Sterile Syringes, TRIMBLE GPS #14E1E, PID (AA) MINIRAE 3000 (ME)

Water Depth: 0.8 ft Estimated Flow: 0.1 cfs

Photograph No(s): 2069

Water Sample Description: Low turbidity, no odor, light brown.

Sample Analyses: VOCs, Tal metals, diss. metals, Perchlorates, SVOCs, PESTICIDES (ME) (FF) (GG)

Filters used: 0.2µm (GG) PTFE, 0.45µm (GG)

No. of Sample Containers: 24

Field Parameters: Conductivity 0.210 mS/cm pH 6.19 ORP: 133 mV

Temp. 10.04 °C DO 0.00 mg/L Turb 5.4 → 5.1 NTU.

Comments: Collect field duplicate 2016WBI-SW-SP902 @ 1400.

(AA) PID = 0.0 ppm

Deviations from FSP: (GG) No GPS Satellites

FTL Signature: Mark Cal Date/Time: 03/22/16 16:40

CH2MHILL

* (ME) changes on 03/22/16

SURFACE WATER COLLECTION FIELD FORM

Project Name: WBI WARMHOUSE BEACH DUMP SITE (6) Project Number: 652441.F1.05 (5)

Date/Time: 3/21/16 1500 (12) Sampler Names: K. Stevens / J. Knuth

Weather: Mid 40's, rain showers

Location ID BKGD-02 Latitude/Longitude: NA (12) /

Sample ID 2016WBI-SW-BKGD-02

Sample Equipment Used: Horiba U50, sterile syringes, TRIMBLE GPS #146188

Tidal Condition: N/A

Estimated Flow Rate: 0.2 cfs

Water Depth: 0.25 ft

Photograph No(s): 2070

Water Sample Description: Clear, no odor, no color

Sample Analyses: VOCs, tal metals, diss. metals (FF) (12), perchlorate, SVOCs, pesticides

Filters used: 0.2um PTFE (12), 0.45um (13)

No. of Sample Containers: 12

Field Parameters: Conductivity 0.0446 mS/cm pH 6.14 174 mV = ORP

Temp. 8.47°C DO 8.68 mg/L 1.8 NTU = Turb

Comments: Collected sample from aprox. 4" waterfall.

Deviations from Sampling Plan: Unable to locate GPS satellites.

FTL Signature: [signature] Date/Time: 03/22/2016 16:00

* (12) CHANGES ON 03/22/16

SURFACE WATER COLLECTION FIELD FORM

Project Name: WBD Dump site (WAREHOUSE BEACH) (KE) Project Number: 652441.F1.05 (KE)

Date/Time: 03/21/16 11000 Sampler Names: K Stevens / J Knuth

Weather: Mid 40's, light rain

Location ID BKGD-03 Latitude/Longitude: NA (ME) /

Sample ID 2016WBI-SW-BKGD-03

Sample Equipment Used: Horiba u500, sterile syringes, TRIMBLE GPS # 14HIF

Tidal Condition: NA

Estimated Flow Rate: 0.2 cfs

Water Depth: 0.25 ft

Photograph No(s): 2071

Water Sample Description: Clear, no odor, no color

Sample Analyses: VOCs, tal metals, diss. (FF) (ME) metals, perchlorates, SVOCs, Pesticides

Filters used: 0.2 (ME) um PTFE, 0.45 um (ME)

No. of Sample Containers: 12

Field Parameters: Conductivity 0.041 mS/cm pH 6.16 ORP: 181 mV

Temp. 8.5°C DO 12.51 mg/L Turb: 3.5 ntu

Comments: BOTTLES FILLED DIRECTLY FROM 4 (ME) " WATERFALL. SMALL STREAM OFF LEFT HAND SIDE OF ROAD & FLOWED INTO CULVERT UNDER ROAD.

Deviations from Sampling Plan: Unable to locate GPS satellites

FTL Signature: Mark Ent Date/Time: 03/22/2016 16:05

* (ME) CHANGES MADE ON 03/22/16

SURFACE WATER COLLECTION FIELD FORM

Project Name: WBD DUMP SITE (WARM HOUSE BEACH) Project Number: 652441.F1.05

Date/Time: 3/21/16 1650 Sampler Names: K. Stevens / J. Knuth

Weather: Mid 40's, rain

Location ID BKGD-10 Latitude/Longitude: NA (1) /

Sample ID 2016WB1-SW-BKGD-10

Sample Equipment Used: Horiba U50, Sterile syringes

Tidal Condition: NA

Estimated Flow Rate: 0.2 cfs

Water Depth: 0.3 ft

Photograph No(s): 2072

Water Sample Description: low turbidity, light brown, no odor

Sample Analyses: VOCs, Tal metals, diss. (FF) (2) metals, perchlorates, SVOCs, pesticides

Filters used: 0.2 µm (2) PTFE, 0.45 µm (2)

No. of Sample Containers: 12

Field Parameters: Conductivity 0.058 mS/cm pH 5.95 ORP: 192 mV

Temp. 8.18°C DO 2.04 mg/L Turb: 7.7 NTU

Comments: BROWNISH WATER, MOSTLY SHALLOW POOLS, SLOW FLOWING STREAM

Deviations from Sampling Plan: Unable to locate GPS satellites

FTL Signature: Mark Ct Date/Time: 03/22/16 16:05

* (2) ALL CHANGES MADE ON 03/22/16

SURFACE WATER COLLECTION FIELD FORM

Project Name: WORMWOOD DUMP SITE Project Number: 652441.F1.05 (ME)

Date/Time: 3/22/16 1100 Sampler Names: K. STEVENS / S. KNUTH

Weather: RAIN, 50°, 45-50°F

Location ID BKGD-05 Latitude/Longitude: NA (KS) /

Sample ID 2016NBI-SW-BKGD-05

Sample Equipment Used: HORIBA U-53, DIGITAL CAMERA, TRIMBLE GPS (MH) #14816

Tidal Condition: N/A

Estimated Flow Rate: 0.2 cfs

Water Depth: 0.25 ft

Photograph No(s): 2073

Water Sample Description: CLEAR, NO ODOR, LOW TURBIDITY, NO COLOR

Sample Analyses: SVOC, PESTICIDES, VOC, PERCHLORATE, TOTAL METALS, DISSOLVED METALS (FF) (ML)

Filters used: 0.2 MICRON PTFE, 0.45 MICRON NYLON

No. of Sample Containers: 12

Field Parameters: Conductivity 0.046 ~~±~~ mS/cm (ST) 5.43 ORP = 237 mV

Temp. 8.69 °C DO 8.15 mg/L TURB = 0.8 NTU

Comments: STEADY FLOW THROUGH ROOTS & GRAVEL WASH BED.

FLOWS INTO CULVERT UNDER ROADWAY

Deviations from Sampling Plan: NO SATELLITES AVAILABLE (KS)

FTL Signature: Mark Cal Date/Time: 03/22/16 16:10

* (MH) ALL CHANGES MADE ON 03/22/16

SURFACE WATER COLLECTION FIELD FORM

Project Name: WBD (WAREHOUSE BEACH) (MC) DUMP SITE Project Number: 652441.F1.05 (MC)

Date/Time: 3/22/16 1155 Sampler Names: K. Stevens / J. Knuth

Weather: Mid 40's, light rain

Location ID: BKGD-04 Latitude/Longitude: NA (MC) /

Sample ID: ZD16WBI-SW-BKGD-04

Sample Equipment Used: Horiba U50 (MC), sterile syringes, TRIMBLE GPS #14818 (MC)

Tidal Condition: NA

Estimated Flow Rate: ~5.0 cfs (MC)

Water Depth: 1.0 ft

Photograph No(s): 2074 2075 (WHITE BOARD IN PHOTO SAYS "2074") (MC) (NO SAMPLE TIME IN PHOTO) (MC)

Water Sample Description: CLEAR, LITTLE TURBIDITY, NO ODOR, NO COLOR

Sample Analyses: VOCs, Tal. metals, dissolved (FF) (MC) metals, perchlorates, SVOCs, pesticides

Filters used: 0.2 µm (MC) PTFE, 0.45 µm (MC)

No. of Sample Containers: 12

Field Parameters: Conductivity 0.048 mS/cm pH 6.11 ORP: 183 mV

Temp. 7.60 °C DO 11.62 mg/L turb: 3.0 NTU

Comments: LARGER STREAM / CREEK. STREAM BED GRAVELY W/ COBBLES. FLOWS INTO 8' FT CULVERT UNDER ROADWAY.

NAME OF CREEK: CLASSET CREEK. (MC)

Deviations from Sampling Plan: NO GPS SATELLITES (MC)

FTL Signature: Mark Cal Date/Time: 03/22/16 16:15

* (MC) ALL CHANGES MADE ON 03/22/16

Field Notes

Rite in the Rain®
ALL-WEATHER
UNIVERSAL FIELD BOOK
№ 374

WARMHOUSE BEACH DUMP SITE
R1/FS

EPA REGION 10; AES 10

652441

BOOK 1 OF ___

INCH

Rite in the Rain®
ALL-WEATHER WRITING PAPER

Name _____

Address NEAH BAY, WA

Phone _____ Email _____

Project WARMHOUSE BEACH DUMP SITE RI/FS

EPA REGION 10 - AES 10

652441

CONTENTS

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STAFF	JEREMIAH KNUTH/CH2M 907.301.6630	
STAFF	KRISTEN STEVENS/CH2M 907.762.1387	

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Scale: 1 square = _____

WBD - WARM HOUSE BEACH DUMP SITE
RI/FS - REMEDIAL INVESTIGATION / FEASIBILITY STUDY
HSSE - HEALTH, SAFETY, SECURITY & ENVIRONMENT
AHA - ACTIVITY HAZARD ANALYSIS
WC - WEST CREEK
US - UNNAMED STREAM
PID - PHOTOIONIZATION DETECTOR
EC - EAST CREEK
BG - BACKGROUND (BKGD)
SW - SURFACE WATER
ALS - ALS LIMITED LABRATORY GROUP
MEL - MANCHESTER ENVIRONMENTAL LABRATORY

Scale: 1 square = _____

WBD 03/14/16

NEAH BAY, WA 652441.FI.05

WEATHER: 1000'S

PURPOSE: SITE MOBILIZATION, PREP FIELD SUPPLIES AND EQUIPMENT FOR RI/FS EVENT 1.

STAFF: MARK ENDO/CH2M
JEREMIAH KNUTH/CH2M
KRISTEN STEVENS/CH2M

1215 J. KNUTH & K. STEVENS ARRIVE @ BELLEVUE OFFICE. SIGN-IN.
- BEGIN LOADING SUPPLIES & FIELD EQUIPMENT AND ORGANIZE.
- M. ENDO PREP FIELD EQUIPMENT & PRINT ALL FIELD PLANS & PAPERWORK.

1530 FIELD VEHICLES (THE DODGE RAM SMALL CARGO VAN) LOADED.

1600 M. ENDO, J. KNUTH & K. STEVENS MOB TO ~~BATTERY~~ WARREN TO DROP OFF CAR.

1615 STAFF MOB TO BAINBRIDGE FERRY.

1820 TAKE SEATTLE -> BAINBRIDE ISLAND FERRY
- STOP FOR GROCERIES & FUEL ON BAINBRIDGE

2330 ALL STAFF ARRIVE @ HOBUCK BEACH RESORT.

Mark Endo 03/14/16

Scale: 1 square = _____

03/15/16

NEAH BAY, WA

WBD 652441.FI.ES

WEATHER: LOW 40'S TO LOW 50'S °F, OCCASIONAL RAIN, WSW WINDS @ 8-15 MPH.

STAFF: MARK ENDO / CHEM, KRISTEN STEVENS / CHEM, JEREMIAH KNUTH / CHEM, EVAN GRIFFITHS / CHEM, MARILYN GAUTHIER / CHEM, JOHN CULLEY / CHEM, SHAWN BLOCKER / EPA; BRET TILLER / EAS, AARON PARKER / MAKAH; PATRICIA BANKS / MAKAH

PURPOSE: DAY 2, EVENT 1 - WEST CREEK / UNAMED CREEK STREAM GAGING & SURFACE SAMPLING.

0730: ALL STAFF MEET @ HOBUCK BEACH RESORT FOR HSSE TAILGATE. STEEP, UNEVEN TERRAIN, RUSTY / DANGEROUS MATERIALS (DO NOT PICK UP) BEARS & OTHER WILD LIFE. VEG & SAMPLING AHA.

0800 ALL STAFF MOB TO WBD SITE

0825 ARRIVE ON-SITE. SITE WALK. PLAN FOR WEST CREEK (WC) & UNNAMED STREAM (US) GAGING & SAMPLING.

0840 M. ENDO, J. KNUTH & K. STEVENS MOB TO HOBUCK TO ORGANIZE SUPPLIES & EQUIPMENT.

0900 ARRIVE @ HOBUCK.

1025 M. ENDO MOB TO CLINIC FOR CONJUNCTIVITIS DOCTOR VISIT.

1030 J. KNUTH CALIBRATE PID
ZERO CAL = 0.0 ppm
SPAN CAL = 100.0 ppm

03/15/16

1035 ~~1040~~ K. STEVENS CALIBRATE HORIBA U-50. AUTOCAL SOLUTION LOT # C584009 EXPIRE DATE 10/2016. U-50 SERIAL # 025039
pH = 4.00, COND = 4.59 mS/cm, DO = 13.55 mg/L, TURB = 0.0 NTU
TEMP = 7.5°C

1055 M. ENDO RETURNS. CLINIC CLOSED UNTIL 13:00 - 17:00

~~1200~~ JT

1130 LEAVE RESORT

1200 GO TO GAS STATION TO FILL UP ~~TIRE~~ LOW TIRE ON VAN

1230 ARRIVE @ SITE PARKING AREA PACK UP GEAR + BOTTLES FOR HIKE TO CLASSET CK BEACH

1245 DEPART TO CREEK BEACH

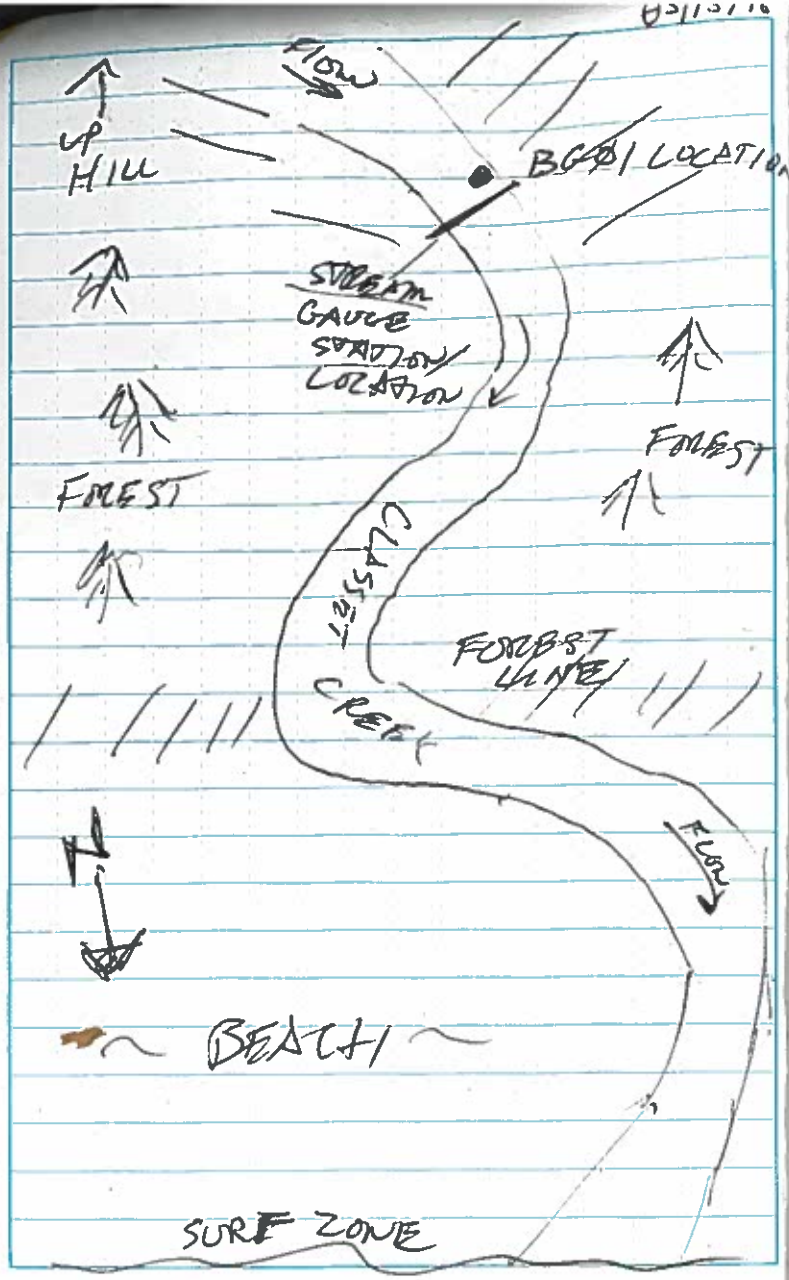
1315 ARRIVE @ CLASSET CREEK BG01 LOCATION. SETUP ~~EQUIP~~ EQUIPMENT & BOTTLES

1326 Collect BG01 ~~AT~~ @ CLASSET CREEK. ~~Collect~~ SEE Surface Water field form ~~Purge forth~~

1315 *Late entry - M. Endo to clinic for non work related health concern.

Scale: 1 square = _____

Scale: 1 square = _____



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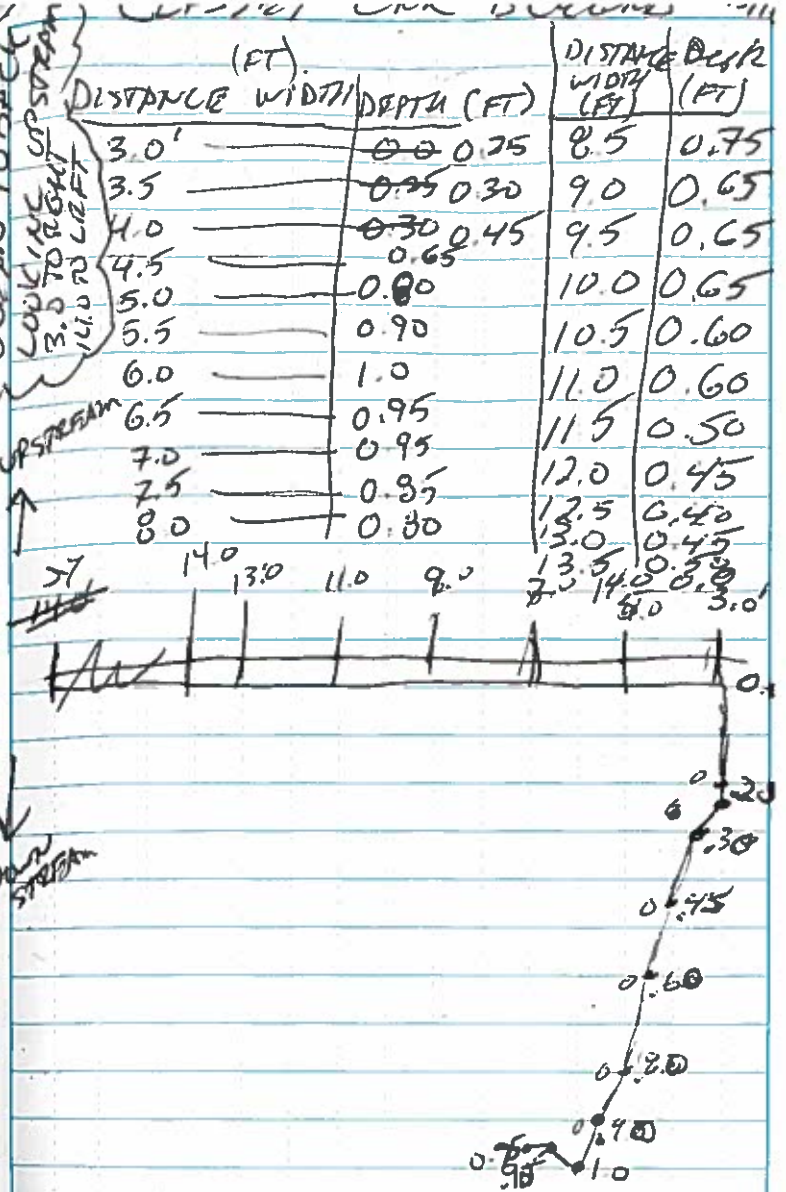

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03/15

CLASSEY CRK VELOCITY

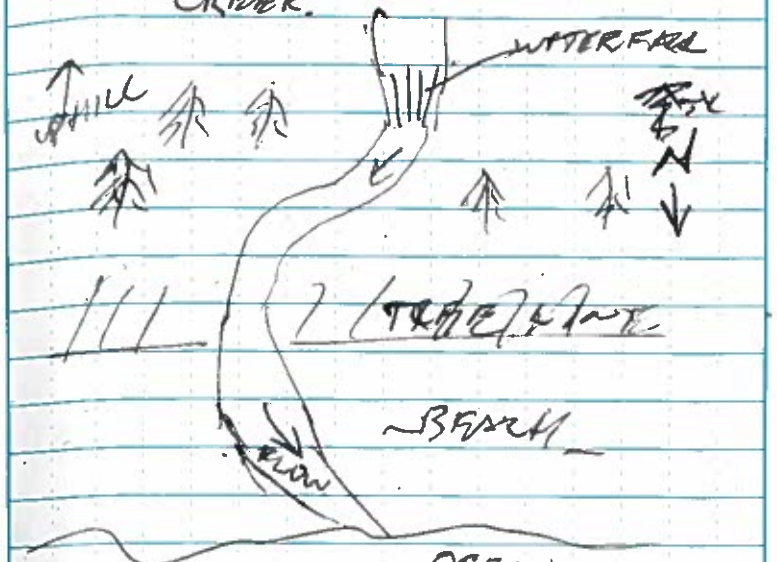
DISTANCE WIDTH (FT)	DEPTH FROM SURF (FT)	VELOCITY FT/S
3.0		0.0
3.5		0.03
4.0	0.19	0.60
4.5	0.26	1.85
5.0	0.32	3.40
5.5	0.36	3.95
6.0	0.40	3.20
6.5	0.35	2.70
7.0	0.38	2.71
7.5	0.34	2.80
8.0	0.32	2.85
8.5	0.3	2.90
9.0	0.26	3.30
9.5	0.26	1.80
10.0	0.26	1.60
10.5	0.24	1.60
11.0	0.24 0.2	1.70
11.5	0.2 0.15	0.86
12.0	0.16	1.20
12.5	0.16	1.20
13.0	0.15	1.40
13.5	0.20	0.60
14.0	0	0.0

Scale: 1 square = _____

03/15/16

1440 COMPLETE STREAM GAGING @ CLASSEY CK.

15:00 STREAM GAGE @ WEST CREEK.

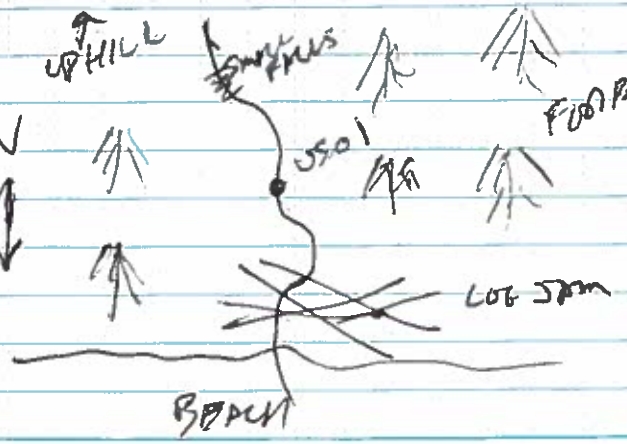


STREAM WIDTH (FT)	~~Depth (FT)~~ Velocity FT/S	~~Velocity FT/S~~ DEPTH (FT)
0	0.75	0.10
0.25	0.61	~~0.15~~ 0.15
0.50	0.98	0.20
0.75	0.92	0.25
1.00	1.20	0.275
1.25	1.09	0.25
1.5	1.05	0.20
1.75	0.95	0.075
2.00	0	0

Scale: 1 square = _____

03/15/16

* Late entry by K. Stevens
1345 Mob to West Creek for Stream Sample.
1415 Arrive @ West Creek. J. Culley leave site to head home.
1430 Collect sample at creek.
Sample ID: WC06
WC06-MS/SD
See ~~Purge form~~ Surface water form
1450 J. Knuth Stream gage aprox. 8ft downstream from stream sample location WC06
1515 Complete Sample WC06
1525 Mob to "UNNAMED STREAM"
1540 COLLECT US01 @ UNNAMED ~~stream~~



Scale 1 square = _____

03/15/2016

UNNAMED STREAM

STREAM WIDTH (FT)	Depth (ft)	Velocity (ft/s)
0	0.09 ~~0.90~~	0.04
0.25	0.1 ~~1.00~~	0.61
0.50	0.07 ~~0.70~~	1.11
0.75	0.05 ~~0.50~~	0.67
1.00	0.01 ~~0.10~~	0.65

1500 * Late entry - J. Culley offsite Nigel offsite
1600 Leave Unnamed Stream Mob to Dump area to vehicles.
1630 Arrive at vehicles. Unload gear, equipment, pack samples. Leave site.
1645 M. Endo out of clinic. Head to Hoburck to demob.
1715 M. ENDO, M. GAUTHIER, K. STEVENS, J. KNUTH PACK SAMPLES/PROCESS.
2230 M. GAUTHIER OFF-SITE.
2300 K. STEVENS & J. KNUTH END FOR DAY.
2380 M. ENDO ENDS DAILY ACTIVITIES, LOCKED & SAMPLES SECURE.

03/15/2016

Scale 1 square = _____

03/16/16 Neah Bay, WA
WBD 6.52441.F1.05

Weather: AM: Low 40's, frost, Sunny

PURPOSE: CONTINUE STREAM SURFACE SAMPLING @ EAST CREEK & KYDIKABBIT CREEK; STREAM GAGE AT SAME CREEKS. DAY 2, EVENT 1

STAFF: MARK ENDO/CH2M, HAMILTON GRUTHER/CH2M, JEREMIAH KNUTH/CH2M, EVAN GRIFFITHS/CH2M, KRISTEN STEVENS/CH2M, NIGEL CROOK/HCI, JARED THOMPSON/MAKAH, ANDREW PARKER/MAKAH, BRETT TILLER/EAS

0730 J. Knuth + K. Stevens meet with FTL decide to prep for the day. Calibrate PID + Horiba. Get sample kits together, load gear and equipment.

0800 M. Endo leave Hobuck to get ice. PID Calibrated: 0.0 ppm zero cal Isobutylene 100.1 span gas

0805 AutoCal exp: 10/16 lot #C584009
4.0 pH 4.49 mS/cm 0 NTU
Pine Horiba U-5000 #25039
PH = 4.00 COND = 4.49 mS/cm
Turb = 0.0 NTU DO = 10.58 mg/L

0830 Tire pressure low Mob to gas station. Mob to Dump site.

0930 M. Endo onsite

1000 Mob to East Creek with

Scale: 1 square = _____

03/16/16

M. Gauthier, Jason, J. Knuth, M. Endo, K. Stevens + Shaun

1030 Arrive at location EC-03 Scope for Stream gage location.

1115 Collect sample EC-03 VOCs, Total metals, dissolved metals, SVOCs, Pesticides. See Surface Water collection form.

1120 Stream gage @ East Creek 2

East Creek 2

~~East~~ Stream Width	Depth feet	Velocity ft/s
~~0.025~~	~~0.25~~	
0.25	0.025	0.1
0.5	0.125	0.26
0.75	0.15	0.50
1.0	0.15	1.1
1.25	0.15	0.85
1.5	0.25	0.27
1.75	0.1	0.15
2.0	0.125	0.1
2.25	0.1	0.14
2.5	0.1	0.14
2.75	0.05	0.0

1130 Stream gage @ East Creek 2

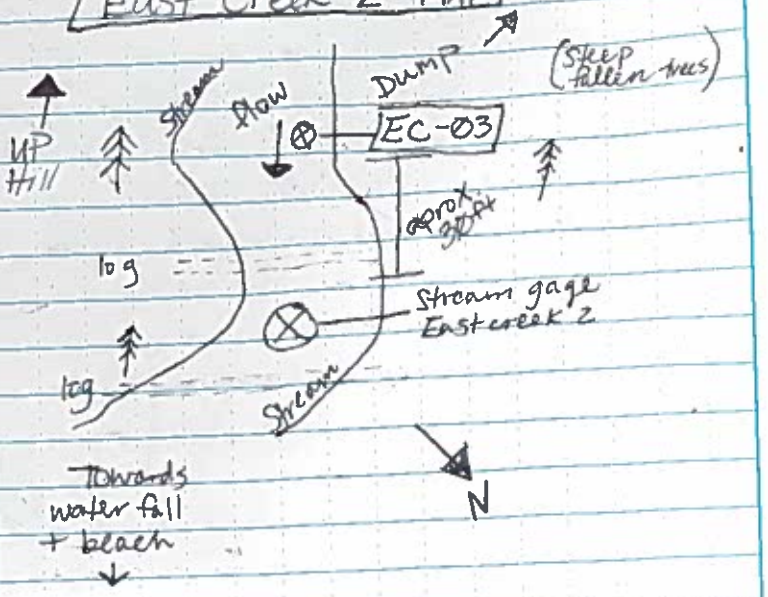
Scale: 1 square = _____

03/16/16

1135 Photos @ East Creek 2. See Photo log.

1140 Marilyn, Shaun, + Jason leave location

East Creek 2 MAP



• 2016WB1-SW-EC-03 WATER QUALITY PARAMETERS

TEMP = 8.39°C, pH = 6.10, ORP = 242mV

COND = 0.261 mS/cm, TURB = 4.48 NTU, DO = 10.18 mg/L

1145 EC-03 SAMPLING COMPLETE. M. GAUTHIER, SHAWN & JASON MOB TO KYDIAKABBIT CREEK (KC) BACKGROUND LOCATIONS (GREEN). M. ENDO, J. KNUTH, K. STEVENS — LUNCH.

1210 MOB TO EC-02 SAMPLE LOCATION.

1230 ARRIVE @ EC-02. MEET w/ JASON.

Scale: 1 square = _____

03/16/16

1230 SAMPLE 2016WB1-SW-EC-02

1245 TAKE FIELD DUPLICATE @ EC-02

2016WB1-SW-EC-902

• EC-02 WATER QUALITY PARAMETERS

TEMP = 8.24°C, pH = 6.41, ORP = 225mV

COND = 0.259 mS/cm, TURB = 4.52 NTU, DO = 10.04 mg/L

1315 COMPLETE SAMPLING @ EC-02.

1330 MOB TO EC-01 SAMPLE LOCATION.

• DROP OFF SAMPLE BOTTLEWARE & STREAM GAUGE EQUIPMENT

1365 @ FIELD VEHICLES. PUT SAMPLES IN COOLERS

1420 M. GAUTHIER OFF-SITE. LEAVING FOR SEATTLE.

• M. ENDO, J. KNUTH, K. STEVENS, T. THOMPSON, B. TILLER —

MOB TO KC-01, KC-02 SAMPLE LOCATIONS.

1500 ARRIVE @ KC-01. SMALL UNAMED STREAM WEST OF KC CREEK (~300ft) WITH UNKNOWN SOURCE.

195 SAMPLE 2016WB1-SW-KC-01

KC-01 WATER QUALITY PARAMETERS:

TEMP = 7.74°C, pH = 6.06, ORP = 229mV

COND = 0.054 mS/cm, TURB = 2.54 NTU, DO = 10.72 mg/L

1535 COMPLETE SAMPLING. MOB TO KC-02. BRETT AARON. MOB TO WAREHOUSE BEACH.

1555 ARRIVE @ KC-02. PREP BOTTLEWARE.

1600 SAMPLE 2016WB1-SW-KC-02

ME 03/16/16

Scale: 1 square = _____

03/16/2016

* KC-02 WATER QUALITY PARAMETERS:
TEMP = 7.77°C, pH = 5.99, ORP = 2.41mV
COND = 0.054 mS/cm, TURB = 2.06NTU, DO = 10.74 mg/L

1630 COMPLETE SAMPLING, MOB TO FIELD VEHICLES.

1655 STAFF ARRIVE @ FIELD VEHICLES. PACK SAMPLES

1715 M. ENDO, J. KNUTH, K. STEVENS MOB FROM SITE.

1730 J. KNUTH & K. STEVENS - DINNER. M. ENDO OBTAIN SAMPLE ICE & TAKE FIELD PAPERWORK.

1830 @ HOBUCK BEACH RESORT W/ J. KNUTH & K. STEVENS TO PROCESS SAMPLES & PREP FOR 03/17/16 SHIPPING.

2015 E. GRIFFITHS ARRIVES @ HOBUCK, HELP W/ SAMPLE PROCESSING.

11:30 E. GRIFFITH DONE W/ SAMPLE ACTIVITIES.

0:15 J. KNUTH & K. STEVENS END DAILY ACTIVITIES

01:00 - M. ENDO COMPLETE FIELD PAPERWORK. END OF DAY 3, EVENT 1.

NOTE: ALL SURFACE WATER LOCATIONS MARKED WITH PINK SURVEYORS TAPE AND LABELED. DIFFICULT TO OBSERVE LOCATION HAVE SECONDARY MARKER. PHOTOS TAKEN OF EACH SAMPLING LOCATION

M. Endo 03/16/2016

Scale: 1 square = _____

WBD 03/17/2016

NEAH BAY, WA 652441.F1.05

WEATHER: MOSTLY SUNNY, LOW 50's °F TO UPPER 50's °F
WEST WINDS @ 8-16mph.

PURPOSE: EVENT 1 - DAY 4, SAMPLE SHIPPING. SURFACE WATER SAMPLING @ EC-01 AND WEST CREEK.

STAFF: MARK ENDO / CH2M
JEREMIAH KNUTH / CH2M
KRISTEN STEVENS / CH2M
MARK LEVITT & NIGEL CROOK / HGI
CALE MARTIN & JIM MARTIN / PACIFIC GEOMATICS

0715 M. ENDO BEGIN SAMPLE SHIPPING PREP FOR SAMPLES TAKEN 03/15 -> 03/16. COORDINATE W/ BRITTANY PRENTICE.

0800 J. KNUTH & K. STEVENS ARRIVE TO BEGIN SAMPLE PROCESSING/SHIPMENT.

0815 J. KNUTH MOB TO MINI MART FOR SAMPLE ICE.

0905 J. KNUTH RETURN TO HOBUCK.

1105 J. KNUTH & M. ENDO MOB TO MAKAH CENTER TO DROP SAMPLES FOR FEDEX. K. STEVENS PREPS SAMPLE KITS & EQUIPMENT.

1135 9 COOLERS (8 FOR ALS, 1 FOR MEL) RELINQUISHED @ MAKAH "PURCHASING," SHIP CENTER W/ NICK.
* ALL TRACKING INFO IN ELECTRONIC FILE.
* CONTACT B. PRENTICE TO NOTIFY OF SAMPLE DROP.

1145 M. ENDO, J. KNUTH ARRIVE @ HOBUCK - LUNCH.

M. Endo 03/17/16

Scale: 1 square = _____

WHB 03/17/16

NEAH BAY, WA 652441.FI.05

1220 CALIBRATE FIELD EQUIPMENT:
FID Mini Rae #19589
Isobutylene # FAP-248-100-7 ex: 5/8/19
Zero cal: 0.0 Span cal: 100.3
1240 Calibrate Horiba U500 #15265 PINE
Auto Cal lot #C584009 exp: 10/16
pH = 4.00, cond = 4.49 mS/cm
turb = 0.0 NTU DO = 9.98 mg/L
1345 ARRIVE @ WHB DUMPSITE.
PREPARE GEAR TO TREK TO
BKGD-06 & EC-01. K. STEVENS,
J. KNUTH, & M. ENDO
* JASON & E. GRIFFITHS MOB TO SAMPLE LOCATION
1405 STAFF MOB TO BKGD-06 SAMPLE LOCATION
1435 ARRIVE @ BKGD-06, LOCATION WEST OF
EC-03. TAKE PHOTO # 2027.
1440 SAMPLE 2016WBL-SW-BKGD-06
• WATER QUALITY PARAMETERS:
TEMP = 7.54°C, pH = 5.73, ORP = 228mV
COND = 0.047mS/cm TURB = 0.0 NTU
1505 COMPLETE SAMPLE ACTIVITIES. STAFF MOB TO
EC-01 LOCATION. MARK BKGD-06 W/ PINK
LABELED FLAGGING & PLACING TWO FLAGS
TO THE EAST TO AID IN LOCATING.
1532 ARRIVE @ EC-01. E. GRIFFITHS & JASON TAKE
BKGD-06 SAMPLES TO COOLERS @ FIELD VEHICLES.

Scale: 1 square = 03/17/16

WBD - NEAH BAY, WA 03/17/2016

1540 ARRIVE @ EC-01
1545 Collect EC01 @ EAST CREEK
SVOCs, VOCs, PESTICIDES,
Perchlorate, Total Metals,
DISSOLVED METALS
TAKE PHOTO OF SAMPLE LOCATION: # 2036
1610 STREAM GAGE @ EC01

STREAM WIDTH (ft)	Depth (ft)	Velocity (ft/s)
0	0	0.00
0.25	~~0.025~~ 0.1	0.00
0.50	~~0.025~~ 0.1	0.00
0.75	~~0.025~~ 0.1	0.00
1.00	~~0.05~~ 0.2	0.00
1.25	~~0.05~~ 0.25	0.00
1.50	0.35	0.19
1.75	0.30	0.62
2.00	0.15	0.21
2.25	0.025	0.01

1615 E. GRIFFITHS & JASON RETURN TO EC-01.
1630 Stream gage complete @ East Creek.
1635 STAFF MOB TO FIELD VEHICLES.
1645 ARRIVE @ FIELD VEHICLES. PACK SAMPLES &
LOAD EQUIPMENT.
1705 ALL STAFF MOB FROM SITE, LOCK GATE.
DINNER.

Scale: 1 square = 03/17/16

WBD 03/17/16

NEAH BAY, WA 65244I.F1.05

1830 J. KNUTH, K. STEVENS, E. GRIFFITS, M. ENDO UNLOAD EQUIPMENT & BEGIN PROCESSING SAMPLES AND PAPERWORK.

1930 E. GRIFFITHS MOBS FROM SAMPLE PREP AREA.

2100 TESTED HORIBA U-53 TO CHECK PARAMETER (SENSOR) OF CONCERN - TURBIDITY. NO TURBID CAL SOLUTION > 0.0 NTU. HORIBA READING = 0.0 NTU TEST INCONCLUSIVE. END OF DAY 4 ACTIVITIES. SAMPLES SECURE.

End 03/17/2016

Scale: 1 square = _____

WBD 03/18/2016

NEAH BAY, WA 65244I.F1.05

WEATHER: LOW 40'S TO LOW 50'S °F, PARTLY CLOUDY, E WINDS @ 15-20mph w/ GUSTS UP TO 25mph.

PURPOSE: DAY 5 - EVENT 1; SHIP SAMPLES FROM 03/17/16. STREAM SURFACE SAMPLE @ WEST CREEK + WEST CREEK 1 STREAM GAGE.

STAFF: MARK ENDO/CH2M, EVAN GRIFFITHS/CH2M JEREMIAH KNUTH/CH2M JASON THOMPSON/MAKAH TRIBE KRISTEN STEVENS/CH2M

0800 Safety tailgate @ Hobuck. M. Endo states he will go to clinic for health issue not related to work.

0810 M. Endo to clinic. J. Knuth + K. Stevens prep samples to ship.

0915 J. Knuth + K. Stevens to Makah Center for FedEx drop off.

0930 J.K. + K.S. to Hobuck to check in with E. Griffiths. E.G will check out after office opens @ 1000.

0940 J. Knuth + K. Stevens to ~~Store~~ dock for ice.

0955 Mob to clinic to meet up with M. Endo. Endo informs us the labeling on the

cont →

Scale: 1 square = _____

3/18/16

Samples need to be changed.

1015 Mob to ~~Hoboick~~ Makah center to pick up coolers. Bring coolers to Hoboick.

1045 E. Griffiths + M. Enda relabel samples. J Knuth + K. Stevens Mob to Dump Site to sample

1100 J. Knuth + K. Stevens arrive at Dump prep for hike to West Creek.

1200 Scope West Creek for sample locations. Arrive at WC04.

1230 Collect sample at WC04. VOCs, TAL metals, dissolved metals, perchlorates, SVOCs, + pesticides. See surface water form.

1315 Mob to WC03.

1330 Collect SW Sample at WC03. VOCs, Tal metals, diss. metals, perchlorates, SVOCs, pesticides. See Surface water form.

1400 Bring samples to vehicle. Mob to West Creek 1 to Stream gage.

Scale: 1 square = _____

3/18/16

1440 Stream gage West Creek 1 Located aprox. 15ft down stream WC03.

Stream Width (ft)	Depth (ft)	Velocity (ft/s)
0	0	0
0.25	0.5	0
0.5	0.125	0
0.75	0.15	0
1.0	0.2	0.08
1.25	0.2	0.11
1.5	0.225	0.17
1.75	0.2	0.24
2.0	0.3	0.21
2.25	~~2.225~~	0.11
2.5	0.225	0.02
2.75	0.225	0.04
3.0	0.15	0.01
3.25	0.125	0
3.5	0	0

J.Knuth (4/21/16) - Correction: the depth value at 2.25 ft width should be 0.225 ft deep.

1500 Stream gage complete at West creek 1. Mob to WC01.

1515 Two deer were across creek.

1545 Arrive at location WC01.

cont→

Scale: 1 square = _____

03/18/2016

1600 Collect samples at WC01. Collect VOCs, Tal metals, diss. metals, perchlorate, SVOCs, pesticides. See Surface water form.

1645 Complete Sample Mob to vehicle

1700 M. Endo arrive on site. Discuss today's activities. J. Knuth fill out Safe Behavior Observation

1710 Demob from dump site. Lock gate.

0900 *Late Entry - K. Stevens

Calibrate Horiba #15265

pH = 4.00, Cond = 4.48 mS/cm

Turb = 0.0 NTU DO = 9.35 mg/L

NOTE: REMAINDER OF ENTRY FOR THE DAY ARE LATE ENTRY NOTES TRANSFERED FROM 2nd NOTEBOOK WHEN FIELD BOOK BECAME AVAILABLE. SUPPLIMENT FOR DAILY NOTES.

0750 M. ENDO PREP FIELD ACTIVITES FOR DAY.

0955 SAMPLES TAKEN ON 03/17/16 FOR SHIPMENT TODAY NEED LABELS REPLACED, THE CLP SAMPLE ID'S ARE MISSING.

12:00 E. GRIFFITHS MOBS TO PORT ANGELES FedEx TO DROP OFF TWO SAMPLE COOLERS THEN MOB TO SEATTLE, WA - E. GRIFFITHS SURVEY ACTIVITIES COMPLETE.

1210 M. ENDO MOBS TO MAKAH DOCKS.

(MJ) 03/15/16

Scale: 1 square =

WBD 03/18/16

NEAH BAY, WA 652441, FI.B3

1225 M. ENDO @ MAKAH DOCK. PURCHASE ~ 650 lbs OF SALINE ICE FOR SAMPLES.

1250 M. ENDO RETURNS TO HOBUCK - FIELD PAPERWORK

1330 M. ENDO TO MAKAH TRIBAL CENTER TO PICK-UP PACKAGES.

1340 @ MAKAH "PURCHASING" CENTER. RECIEVED 5 PACKAGES: ULINE 6"x9" bags, NON-STERILE 0.45 µm PTFE FILTERS (SYRINGE), 0.2µm STERILE, PTFE HYDROPHILIC SYRINGE FILTERS, 150mL NALGENE 0.2µm STERILE VACUUM FILTERS (INCORRECT ORDER), AVERY 8363 SHIPPING LABELS, 40mL AMBER 1:1 HCL VOAs.

1415 M. ENDO MOB TO HOBUCKS TO CONTACT CHEM WAREHOUSE AND ORGANIZE SUPPLIES. FIELD PAPERWORK

1630 M. ENDO MOB TO HOBUCK OFFICE.

- FIND OUT CABINS ARE ONLY RENTED UNTIL SUNDAY, 20th (SHORT OF PROJECT LENGTH) ARRANGE FOR 3 CABINS THROUGH WED, 23rd w/ NADINE.

1745 M. ENDO ARRIVE @ HOBUCKS FOR FIELD PAPERWORK QC SAMPLES & LABELS. J. KNUTH, K. STEVENS @ DINNER.

1930 J. KNUTH & K. STEVENS @ HOBUCKS - ALL STAFF PROCESS SAMPLES & ORGANIZE FIELD EQUIPMENT.

2115 END OF DAY 5. SAMPLES SECURE.

MJ 03/18/16

Scale: 1 square =

WBD

03/19/16

652441. FLOS

NEAH BAY, WA

WEATHER: CLOUDY, UPPER 40'S TO LOW 50'S °F, ENE WINDS @ 5-10 mph, LIGHT SCATTERED SHOWERS THROUGH DAY.

PURPOSE: EVENT 1, DAY 6 - SAMPLE SURFACE WATER IN WEST CREEK, SEEPS AND NEW UNNAMED STREAM B + STREAM GAGE.

STAFF: MARK ENDO/CHZM
JEREMIAH KNUTH/CHZM
KRISTEN STEVENS/CHZM
JASON THOMASSON/MAKAH TRIBE

820 CALIBRATE PID MINI RAE 3000
SERIAL# 19889. ZERO GAS: 0.0 ppm
SPAN GAS = 100.2 ppm. 100 ppm ±5% Isobutylene
LOT # FAP-248-100-7. EXP. 5/8/19

825 CALIBRATE HORIBA U-500 # 15265
SONDE # 21280, AUTOCAL LOT# C584009
TEMP = 19.43 °C
PH = 4.00
ORP = 280 mV
COND = 4.48 mS/cm
TURB = 0.0 NTU
DO = 8.73 mg/L

935 ARRIVE @ WB DUMP SITE
LOAD UP SAMPLE EQUIPMENT + BOTTLES FOR WC-02 + SP-04
DEPART TO WC-02.

1010 Collect 2016 WB1-SW-WC-02
TAKE PHOTOS # 2047 + 2048

1050 MOB TO SP-04. DIG OUT POOL FOR SEEP WATER TO COLLECT.

1115 Collect SAMPLE
2016 WB1-SW-SP-04
DIG SMALL POOL @ SEEP LOCATION AND LET SHEET FLOW FILL POOL FROM POOL WALLS. ALLOW TO SETTLE SEDIMENT FOR 10-15 MINS BEFORE SAMPLING. M. ENDO ARRIVES

1200 MOB TO WC-05. M. ENDO ~~TO~~ LEAVES TO GET ~~LUNCH~~ ICE

1230 COLLECT 2016 WB1-SW-WC-05 FROM FLOWING CREEK.

1310 MOB TO TRUCK TO DROP OFF SAMPLES + GET EMPTY BOTTLES
TAKE SNACK/REST BREAK.
HYDRATE!!

1330 Called Marylyn to discuss surfers in area.

1335 Jason spoke with Tribal leader and asked surfers to leave area.

1400 J. Knuth + K. Stevens to MSB-01.
M. Endo + Jason to SP-05.

Con't →

Scale: 1 square = _____

3/19/16

1445 J. Knuth + K. Stevens arrive at location USB-01.

1500 Collect USB-01 SW sample. See SW collection form.

1535 Stream gage Unnamed Stream B.1 (1) Located aprox. 30' downstream of USB-01. Stream 9 inches wide.

Stream Width (ft)	Depth (ft)	Velocity (ft/s)
0.0	0.0	0
0.25	0.030	0.09
0.5	0.125	0.46
0.75	0.0	0

Field Duplicate

width	Depth	
0.0	0.0	0.0
0.25	0.025	0.03
0.5	0.125	0.40
0.75	0.0	0.0

1600 Stream gage and field duplicate complete at Unnamed Stream B.1 (2)

1630 An otter was running across East Beach. Mob to vehicle.

Scale: 1 square = _____

3/19/16

1700 Arrive at vehicle. Call M. Endo. Endo needs supplies at SP05. Mob to SP05 to meet Jason and M. Endo. Help collect sample at SP05. See SW collection form.

1740 J. KNUTH, K. STEVENS ARRIVE @ US-02/SP-05 SAMPLE LOCATION. HELP COMPLETE SAMPLING SP-05 AND TAKE WATER QUALITY PARAMETERS @ US-02 & SP-05, PHOTOS 2010 & 2008 2009

1820 COMPLETE TASKS @ US-02/SP-05. M. ENDO, K. STEV J. KNUTH, J. THOMPSON MOB TO FIELD VEHICLES.

1838 ARRIVE @ FIELD VEHICLES, PLACE SAMPLES IN COOLERS & UNLOAD SUPPLIES & EQUIPMENT

- TOMORROW'S PLAN - 2 CH2M STAFF + JASON @ DUMP FOR SAMPLING, 1 CH2M STAFF IN TOWN FOR SAMPLE PROCESSING. DUMP START TIME = 0900

1900 ALL STAFF MOB FROM DUMP, SECURE GATE.

1928 ARRIVE @ HUBUCK - DINNER

2030 ALL STAFF/CH2M ORGANIZE FIELD EQUIPMENT & SUPPLIES. FIELD PAPERWORK - PREP FOR NEXT DAY SAMPLING ACTIVITIES.

2215 END OF DAY 6 ACTIVITIES. SAMPLES SECURE.

NOTE: REMAINDER OF DAILY LOG ARE LATE ENTRY NOTES, TRANSFERRED ONCE FIELD NOTEBOOK BECAME AVAILABLE

0630 M. ENDO PREP FIELD PAPERWORK FOR DAILY ACTIVITIES

0730 J. KNUTH & K. STEVENS ARRIVE FOR FIELD PREP.

@ 3/19/16

Scale: 1 square = _____

03/19/16

WOO

652441.FI.05

Neah Bay, WA

- Contact Marilyn Gauthier to Discuss Field Event Extension. (@ ~0835)
- Change J. Knuth & K. Stevens flights to ANC.

0915 J. Knuth & K. Steven's MOB to Dump Site.
M. Endo contact J. Thompson - No answer.

0920 M. Endo Receives Email from J. Crawford / EPA
- 03/17/16 Samples (EC-01 & BKGD-06) did not arrive @ ALS Lab. [Shipped 03/18/16, Expected Arrival Morning of 03/19/16].

0925 M. Endo contact M. Gauthier & B. Prentice to notify & Discuss Plan Forward.

1015 Concluded that 03/17/16 sample shipment are "in transit" status from Port Angeles, Fairchild FedEx - most likely in storage (FedEx - Facility in Utah. No FedEx operations / staff at that location on weekend. Sample shipment scheduled to arrive Monday, 21st morning, @ ALS

1020 M. Endo MOB to Hoquiam office to confirm cabin changes then to Dump Site.

1050 M. Endo arrives @ Dump Site. Don PPE & Prep supplies. Staff @ SP-04.

1235 M. Endo @ Makah Docks. Bag ice for samples

1320 M. Endo MOB from Docks to Dump Site.

1345 M. Endo @ Dump Site Gate.
- 3 vehicles w/ surf Equipment & Owners Parked outside Gate.

Scale: 1 square = ____

03/19/16

03/19/16

652551.FI.05

- Makah Tribal Police pulled up to inquire of activities. Notified of Sampling Event & Access Authorization.
- Police officer same w/ surfers - allowed access through site, but no camping allowed.

1400 M. Endo arrive @ Dump Site. Contact M. Gauthier (meet w/ J. Knuth & K. Stevens, J. Thompson of approaching surfers on foot). To discuss surfer access to site = Not allowed on-site. Defer to J. Thompson / Makah Tribe.

1415 M. Endo & J. Thompson MOB to US-02.

1435 M. Endo & J. Thompson arrive @ US-02 / SP-05 Location. Set-up for Sampling.

15:00 Sample 2016SW1-SW-US-02. Used sterile syringe to fill all bottleware. On filtered samples, two syringes were used to avoid unfiltered water getting into samples. One syringe to filter sample water (clean) the second to withdraw water from stream & fill first, clean syringe.

1620 Complete Sampling, US-02. Prep for SP-05

1635 Sample 2016SW1-SW-SP-05. Same syringe conditions & procedure ~~for~~ as US-02.

Mark End

03/19/16

Scale: 1 square = ____

WBD

03/20/16

652441. FI. 05

NEPH BAY, W4

WEATHER: CLOUDY, SCATTERED RAIN, MID 40'S TO LOW 50'S °F, ESE WINDS @ 8-13 mph.

PURPOSE: DAY 7, EVENT 1 - COMPLETE SAMPLING SEEP LOCATIONS, KYDIKABBIT CREEK BACKGROUND LOCATION SAMPLE COLL.

STAFF: MARK ENDO/CH2M, KRISTEN STEVENS/CH2M, JEREMIAH KNUTH/CH2M, JASON THOMPSON/MAKAH TRIBE.

0630 M. ENDO PREP FIELD PAPERWORK.

0735 J. KNUTH & K. STEVENS ARRIVE. PREP FIELD SUPPLIES & CALIBRATE FIELD EQUIPMENT.

0800 • HORIBA U-52 CONTROL: 15265 SONDE = 21280
AUTO CAL SOLN LOT # CSE4001 EXP. 10/16
pH = 4.0, COND = 4.49 mS/cm, TURB = 0.6 NTU
DO = 10.52 mg/L.

• PID MINIRAE 3000 PUMP # 19889.
CAL GAS C_4H_8 (100 ppm) LOT # FAP 246-100-7
ZERO (FRESH AIR) = 0.0 ppm, SPAN (ISO) = 100.1 ppm

0840 Tailgate safety meeting. See FTSP

0900 J. Knuth + K Stevens leave Hoback head to site. Call Jason informal as he might be onsite in p.m.

0920 Unlock gate at dump. Prep for hike. Mob to SP03.

1000 Collect Sample at SP03. See Seep Water Collection form.

Scale: 1 square = _____

3/20/16

1030 Collect 20160WBI-SW-SP03. See Seep Water collection form @ SP03. Collect field duplicate Parameters. See seep water form.

1055 Complete Sampling @ SP03. Mob to vehicle.

1130 At location SP01. Unable to locate any flowing or standing water to sample. Ground is not saturated. Move to site SP02. Clear area to sample. Plan to sample SP02 at end of day. Mob to vehicle for bkgd glassware.

1230 Mob to Background locations at Kydikabbit Creek. Lock gate.

1245 Collect Sample at BKGD-07. Sample 20160WBI-SW-BKGD-07. Collect MS/SD. 36 bottles VOCs, tal metals, dissolved metals, SVOCs, Perchlorates, + pesticides. See Surface water collection form.

1345 Sample collection complete.

1420 Mob to BKGD-09.

1440 Collect Sample at BKGD-09. Sample ID: 20160WBI-SW-BKGD-09. See surface water form.

cont →

Scale: 1 square = _____

3/20/16

1515 Sample Collection complete. Mob to BKGD-08.

1530 Collect SW Sample at BKGD-08
Sample ID: 20160WB1-SW-BKGD-08
See SW collection form.

1615 Sample complete. Mob to vehicle.

1630 Leave Site. Meet up with M. Endo fill coolers with ice.

1730 Mob to Hobuck prep coolers for shipping.

1800 Dinner.

1835 M. ENDO, J. KNUTH, K. STEVENS RESUME SAMPLE PROCESSING & FIELD PAPERWORK.

2020 DURING SAMPLE PROCESSING, ONE 40ML VOA BROKE FROM 2016WB2-SW-SP-903. NOTIFY B. PRENTICE ALL COC MODIFICATIONS.

2230 J. KNUTH & K. STEVENS END DAILY TASKS. M. ENDO CONTINUES W/ FIELD PAPERWORK + QC.

2330 END OF DAY 7 ACTIVITIES. SAMPLES SECURE.

NOTE: THE FOLLOWING ARE LATE ENTRIES, TRANSFERED ONCE FIELD BOOK BECAME AVAILABLE.

0850 M. ENDO REMAINS @ HOBUCK FOR FIELD PAPERWORK AND SAMPLE MANAGEMENT.

1140 M. ENDO CONTACTED BY J. KNUTH, SP-01 DRY PLANNED TO MOVED TO SP-02 AND WATER QUALITY PARAM. TO TO SP-03.

1545 M. ENDO MOB TO MAKAH DOCK TO FILL ICE BAGS FROM

Scale: 1 square =

(2) 03/20/2016.

USD EVENT 1 - DAY 8 03/21/2016

NEAH, BAY, WA G52.441-FI.E

WEATHER: CLOUDY, HEAVY RAIN, MID 40'S TO LOW 50'S°F, SE WINDS @ 6-11 mph.

PURPOSE: SAMPLE SHIPMENT TO ALS (COOLERS #11-22). SAMPLE DUMP SEEP SP-01, SP02 & KYDIKAOSIT CREEK BKGD-10, CLASSET CREEK - BKGD-02. ADDITIONAL IF AL

STAFF: MARK ENDO / CH2M KRISTEN STEVENS / CH2M JEREMIAH KNUTH / CH2M JASON THOMPSON / MAKA

(2)

0615 M. ENDO BEGIN COC, LABEL, SHIPPING QC FOR TODAYS SAMPLE SHIPMENT

0800 J. KNUTH, K. STEVENS ARRIVE. BEGIN SAMPLE PROCESSING / QC FOR SHIPMENT.

0905 M. ENDO CONTACT J. THOMPSON TO INFORM OF DAILY ACTIVITIES & TIMING. WILL CONTACT WHEN FIELD TEAM IS READY TO MOB TO DUMP SITE.

0930 NOTIFIED THAT SHIPMENT #2 SENT ON 03/18/16 (EC-01, BKGD-06) ARRIVED @ ALS LABARATORY.

1130 M. ENDO LEAVES HOBUCK RESORT TO DELIVER 12 FULL COOLERS TO MAKAH CENTER FOR FEDEX PICKUP. COOLERS #11-22 IN TOTAL.

1140 CALIBRATE PID & PREP SAMPLE KITS MINI RAE 3000 #19889. CAL GAS LOT# FAP-148-100-7 ZERO GAS @ 0.0ppm / SPAN = 100.3ppm

Scale: 1 square =

3/21/16

1200 Calibrate Horiba #15265, #21280 AutCal Solution #C584009 ex: 10/16 pH: 4.00 cond: 4.50 mS/cm Turb: 0.0 NTu DO: 12.34 mg/L

1215 Jason arrives at Hobuck to check in.

1225 M. Endo back to Hobuck Health & Safety tailgate with field team + Jason.

1245 Mob to site. M. Endo will go to clinic for non work related health issue.

1300 Arrive at dump site. Scope out SP01. Unable to locate seep to sample. Mob to SP02.

1325 Collect sample 2016WB1-SW-SP02 ~~and field duplicate 2016WB1-SW-SP902~~ See SP02 Seep water form.

1400 Collect sample field duplicate 2016WB1-SW-SP902. See SP902 Seep water form. (ON SP-02)

1430 Complete sample. Mob to vehicle. Mob to Classet Creek for Background sample. M. Endo on site. M. Endo Scope out sample locations.

Scale: 1 square = _____

3/21/16

1500 Collect sample 2016WB1-SW-BKGD-02 @ BKGD-02. See SW collection form.

1515 M. Endo + Jason offsite.

1530 Sample collection complete. Mob to BKGD-03.

1600 Collect Sample 2016WB1-SW-BKGD-03 @ BKGD-03 See SW collection form.

1630 Sample collection complete. Mob to BKGD-10. Lock gate.

1650 Collect sample 2016WB1-SW-BKGD-10 See SW collection form.

1730 Sample collection complete @ BKGD-10 Kydikabbit Creek.

1750 J. KNUTH, K. STEVENS LOAD FIELD VEHICLE & STOW SAMPLES. MOB TO HOBUCKS. SECURE GATE.

1810 J. KNUTH & K. STEVENS ARRIVE @ HOBUCKS, UNLOAD SAMPLES & FIELD EQUIPMENT W/ M. ENDO.

1820 M. ENDO QC SAMPLE LABELS & WRITE-UP FIELD PAPERWORK. REMAINING STAFF - DINNER.

1900 J. KNUTH, K. STEVENS ARRIVE, SAMPLE PROCESSING, BLS & MEL SAMPLE LOCKERS FOR TOMORROWS SHIPMENT.

2100 UPON CUSTODY SEAL (EPA) COUNT - WILL BE SHORT TWO SEALS FOR FINAL SHIPMENT. INQUIRE W/ B. PRENTICE & J. CRAWFORD.

2145 END OF DAY & TASKS. SAMPLES SECURE.

03/21/2016

Scale: 1 square = _____

WBD

03/21/16

NEAH BAY, WA 652441.F1.05

NOTE: THE FOLLOWING NOTES ARE TRANSFERED FOR SEPERATE NOTEBOOK FROM FIELD ACTIVITES THAT OCCURED WHILE FIELD NOTEBOOK WAS UNAVAILABLE.

1145 M.ENDO ARRIVES @ MAKAH SHIPPING SAMPLES, DROP 12 COOLERS OFF W/ NICK FOR FEDEX EXPRESS SHIPPING TO ALS.

1425 M.ENDO MOB FROM CLINIC TO DUMP SITE.

1440 M.ENDO ARRIVES @ DUMP SITE. MEET W/ J.KNUTH, K.STEVENS & J.THOMPSON. MOB TO CLASSET CREEK BACKGROUND LOCATIONS.

1445 ARRIVE @ BKGD-02, SMALL DOWN HILL STREAM OFF LEFT HAND SIDE OF ROAD (UNAMED) FLOWING INTO CULVERT.

1500 M.ENDO & J.THOMPSON MOB TO BKGD-03. SIMILAR DESCRIPTION TO BKGD-02.

1508 M.ENDO & J.THOMPSON ARRIVE @ BKGD-04. CLASSET CREEK - DOWN MODERATLY STEEP SLOPE ON LEFT HAND SIDE OF ROAD, MARKED W/ GREEN SURVEYORS TAPE.

1520 M.ENDO & J.THOMPSON MOB FROM DUMP SITE. M.ENDO MOB TO MAKAH SHIPPING FOR PACKAGES.

1540 @ MAKAH CENTER. 2EE 0.2 PTFE & NYLON FILTERS, (WHITE TYPE) AND TYPE II DI H_2O.

1600 M.ENDO @ HOBUCKS - FIELD PAPERWORK & SAMPLE MANAGEMENT.

1810 J.KNUTH, K.STEVENS ARRIVE @ HOBUCKS UNLOAD FIELD VEHICLES & SAMPLES.

ME 03/21/16

Scale: 1 square =

WBD EVENT 1 - DAY 1 03/22/2016

NEAH BAY, WA 652441.F1.05

WEATHER: CLOUDY TO PARTLY CLOUDY, MID 40'S TO LOW 50'S °F W WINDS @ 10-15 mph.

PURPOSE: SEND SHIPMENT #4 TO ALS (COOLERS #23->26) AND SHIPMENT #2 TO MEL (COOLER #2). COMPLETE SAMPLING CLASSET CREEK BKGD-04, BKGD-05 AND INSPECT AND POTENTIALLY SAMPLE SP-01.

STAFF: MARK ENDO/CH2M KRISTEN STEVENS/CH2M JEREMIAH KNUTH/CH2M JASON THOMPSON/MAKAH

0600 M.ENDO BEGINS FIELD PAPERWORK, QC COOLER LOGS & SHIPPING DOCS. CONTACT W/ B.PRENTICE.

0700 J.KNUTH, K.STEVENS ARRIVE. SAMPLE PROCESSING NOTIFY OF EPA ALLOWANCE FOR ONE CUSTODY SEAL ON EXTERNAL COOLER (WE WILL PLACE TWO EPA SEALS EXTERNAL AND ONE HAND MADE SEAL ON SAMPLE COOLER BAGS.).

0830 JASON T./MAKAH CALLS. GIVEN UPDATE ON MCANIC SCHEDULE. HE WILL MOB TO HOBUCK TO OBTAIN NOTES MISSING FROM HIS OVERSIGHT.

0848 NOTIFIED THAT SHIPMENT #3 (03.21.16) ARRIVED @ ALS.

0900 J.THOMPSON @ HOBUCKS. OBTAIN SAMPLE DATES FOR GAP IN OVERSIGHT NOTES & UPDATES HIS SAMPLE LOCATION FIELD MAP.

0930 SAMPLE PROCESSING COMPLETE, SHIPMENT #4 TO ALS AND SHIPMENT #2 TO MEL (COOLERS # 23->26 AND #2, RESPECTIVLY) COOLERS LOADED INTO FIELD VEHICLE.

ME 03/22/16

Scale: 1 square =

WBD 03/22/16

NEAH BAY, WA 652441.F1.05

0940 PREP FIELD VEHICLES, CALIBRATE FIELD EQUIPMENT & LOAD VEHICLES.

NOTE: J. THOMPSON NOTED THAT MARK PARKER/MAKAH IS TAKING BEACH SAMPLES NEAR HOBUCK BEACH AREA.

0950 Calibrate Horiba #15265, #21280
AutoCal Solution #C584009 EXP: 10/16
PH: 4.0, Cond: 4.52 mS/cm
Turb: 0.0 NTU DO: 13.35 mg/L

0955 CALIBRATE MINI RAE 3000
F/D. ZERO GAS = 0.0 ppm
SPAN GAS = 100.6 ppm, PINE #
19089, LOT# FAP-248-100-7

1030 J. Knuth + K. Stevens mob to dump site. Meet Jason at gate. Mob to Classet Creek background location BKGD-05

1100 Collect sample at BKGD-05. 2016WB1-SW-BKGD-05 See form.

1125 M. Endo onsite. Sample collection complete

1135 Mob to BKGD-04.

1155 Collect sample at BKGD-04 2016WB1-SW-BKGD-04 See SW collection form.

1220 Sample complete @ BKGD-04 Mob to SP-01 area.

Scale: 1 square = _____ CE 03/22/16

WBD 03/22/16

NEAH BAY, WA 652441.F1.05

* ENTERIES OUT OF CHRONOLOGICAL ORDER, FIELD NOTES TRANSFERED WHEN FIELD NOTEBOOK WAS AVAILABLE.

* 10:10 M. ENDO MOB TO MAKAH SHIPPING CENTER TO DROP OFF 5 SAMPLE COOLERS. NOTIFY JASON THOMPSON OF ARRIVAL TIME @ DUMP SITE & MORNING TASKS.

* 10:25 M. ENDO DROP SAMPLES OFF @ MAKAH CENTER, DISCUSS SHIPMENT SCHEDULE FOR THE 23rd.

* 11:05 M. ENDO @ GENERAL STORE FOR SAMPLE ICE.
" MOB TO DUMP SITE.

* 1125 M. ENDO ARRIVE @ DUMP SITE - NEAR BKGD-05. MEET W/ J. KNUTH, K. STEVENS & J. THOMPSON.
• M. ENDO & J. THOMPSON MOB TO DUMP TO PERFORM 2nd SEEP SURVEY.

1235 M. ENDO & J. THOMPSON COMPLETE SURVEY - NO SEEP LOCATIONS FOUND ON NORTH, WEST OR EAST SLOPES (UPPER SECTIONS) NOT PREVIOUSLY LOCATED.
- HEAVY VEGITATION ON NORTH SLOPE.
• MEET W/ J. KNUTH & K. STEVENS @ TOP OF DUMP PARKING. M. ENDO TO MOB TO MAKAH SHIPPING TO CHECK ON SAMPLES, REMAINING STAFF TO HOBUCKS.

1310 ALL STAFF @ HOBUCKS. UNLOAD FIELD VEHICLES & SAMPLES. ORGANIZE SUPPLIES & EQUIPMENT. SEND DATA TO B. PRENTICE.

CE 03/22/16

Scale: 1 square = _____

WBD

03/22/16

NEAH BAY, WA

652441.FI.05

1345 TURN OVER WAREHOUSE DUMP GATE KEY TO JASON THOMPSON.

1355 J. THOMPSON MOB TO MAKAH CENTER.

1440 NOTIFIED BY NICK BUCK @ MAKAH SHIPPING THAT SHIPMENT OF COOLERS WERE PICKED UP BY FEDEX. NOTIFIED B. PRENTICE.

1530 TWO COOLERS (#27, 28) PACKED FOR ALS AND ONE (#3) FOR MEL. COC FROM SCRIBE BEING GENERATED. CONTINUE CLEANING, ORGANIZING & PACKING FIELD EQUIPMENT & SUPPLIES + FIELD PAPERWORK

1725 J. KNUTH, K. STEVENS, M. ENDO STOP WORK FOR DINNER. END OF DAY 9 TASKS. SAMPLES SECURE.

Mark Endo 03/22/16

Scale: 1 square = _____

WBD

EVENT 1 - DAY 10

03/23/2016

NEAH BAY, WA

652441.FI.05

WEATHER: CLOUDY, RAIN, MID 40'S TO LOW 50'S°F S TO SSE WINDS 5-20mph.

PURPOSE: DROP OFF SAMPLE COOLERS @ PORT ANGELES FEDEX (ALS #27, #28 & MEL #3). LOAD FIELD EQUIPMENT & SUPPLIES & MOBILIZE TO BELLEVUE CHEM OFFICE. STORE EQUIP/SUPPLIES.

STAFF: MARK ENDO/CHZM
JEREMIAH KNUTH/CHZM
KRISTEN STEVENS/CHZM

0600 M. ENDO CONTINUES FIELD PAPERWORK, QC & SAMPLE MANAGEMENT.

0630 J. KNUTH, K. STEVENS ARRIVE - SAMPLE QC & PROCESSING + EQUIPMENT/SUPPLY ORGANIZATION & FIELD VEHICLE LOADING

0820 J. KNUTH MOBS TO MINI MART FOR MORE SAMPLE ICE.

0850 J. KNUTH RETURNS, PACK SAMPLES FOR SHIPMENT.

1040 MOB FROM HOBUCK CABINS TO HOBUCK OFFICE TO CHECK OUT.

1100 ALL STAFF MOB TO PORT ANGELES FEDEX

1245 ARRIVE @ FAIRCHILD FEDEX. CLOSED UNTIL 13:30 FOR LUNCH.

- EMPLOYEE ARRIVED & ALLOWED COOLERS TO BE PLACED INSIDE.

1255 MOB TO GAS STATION.

1636 ARRIVE @ OFF-SITE RENTAL CAR RETURN TO DROP OFF C1919SF & J. KNUTH & K. STEVENS

ED 03/25/16

Scale: 1 square = _____

WBD

03/23/2016

Neah Bay, WA

65244/.F1.05

17:00 M. Ende MOB to Bellevue office.

17:30 Arrive @ Bellevue office, Unload Rental Equipment.

- MOB to warehouse w/ C. Schwartz to stock field supplies.

18:30 Complete field activities for Event #1.

Mark Ende 03/23/2016

Scale: 1 square = _____

Scale: 1 square = _____

Photographs

CH2MHILL

PROJECT NUMBER	DATE	SHEET 1 OF 3
652441.F1.05	3/15/2016	

PHOTOGRAPH LOG

PROJECT: WARMHOUSE DUMP SITE - EVENT 1 LOCATION: WARMHOUSE DUMP NEAR BAY, WA

PHOTO NO.	SCENE DESCRIPTION
2002	CLASSET CREEK SURFACE WATER SAMPLING. LOOKING WEST.
2003	K. STEVENS SURFACE WATER SAMPLING CLASSET CREEK. LOOKING WEST
2004	CLASSET CREEK SAMPLING & STREAM GAGE ~~LOCATION~~ LOCATION. LOOKING NW
2005	" " " " " LOOKING SOUTH
2006	" " " " " LOOKING SOUTH
2007	" " " " " " "
2008	WEST CREEK SURFACE SAMPLE LOCATION. LOOKING SW
2011	" " " " " . LOOKING NE
2012	WEST CREEK SAMPLE SITE FROM BEACH. LOOKING N.
2013	UNNAMED STREAM SURFACE ~~SAM~~ WATER SAMPLING LOCATION. LOOKING SW
2014	" " " " " " " "
2015	SURFACE WATER SAMPLING UNNAMED STREAM
2016	2016-WB1-SW-EC03 SAMPLE LOCATION. LOOKING WEST.
2017	" " " " " " " "
2018	EC02 ~~SAMPLE~~ STREAM GAGE LOCATION. LOOKING SE.
2019	" " " " " "
2020	EC02 SAMPLE LOCATION. LOOKING WEST.
2021	B1. ENDO COLLECTING EC02. LOOKING WEST.
2022	KC01 SAMPLE LOCATION. LOOKING SW.
2023	" " " " "
2024	E. GRIFFITHS HOLDING SIGN @ KC01. LOOKING SW.
2025	K. STEVEN HOLDING SIGN @ KC02. LOOKING E.
2026	SAMPLE LOCATION @ KC02. LOOKING E.
2027	BKGD-01 SAMPLE LOCATION. LOOKING SOUTH
2028	" " " " " . 2ND PHOTO
2029	" " " " " 3RD PHOTO
2030	EC01 SAMPLE LOCATION & STREAM GAGE LOCATION. LOOKING EAST
2031	" " " " " " " " 2ND PHOTO

CH2MHILL

PROJECT NUMBER	DATE	SHEET
652441.F1.05	3/18/16	2 OF 3

PHOTOGRAPH LOG

PROJECT: WARM HOUSE BEACH DUMP ~~HOOS~~ SY EVENT 1 SITE LOCATION: NEAH BAY, WA

PHOTO NO.	SCENE DESCRIPTION
2032	WCØ4 SAMPLE LOCATION. LOOKING EAST
2033	" " " " " DUPLICATE
2034	" " " " " 2ND DUPLICATE
2035	WCØ3 SAMPLE LOCATION. LOOKING SOUTH
2036	" " " . LOOKING EAST
2037	WEST CREEK 1 STREAM GAGE LOCATION. LOOKING SE.
2038	DEER IN FOREST NEAR WCØ3. LOOKING SE.
2040	" " " " " " "
2044	WCØ1 SAMPLE LOCATION. LOOKING SE.
2045	" " " . LOOKING E.
2046	" " " " LOOKING S.
2047	WCØ2 SAMPLE LOCATION. LOOKING NE.
2048	" " " " "
2049	SPØ4 SAMPLE LOCATION. LOOKING N.
2050	WCØ5 SAMPLE LOCATION. LOOKING N.E.
2051	" " " " "
2055	USB-Ø1 SAMPLE LOCATION. LOOKING S.
2056	" " " " " "
2057	" " " " " "
2058	SPØ5 SAMPLE LOCATION. LOOKING NE.
2059	SPØ5 SAMPLE LOCATION. LOOKING N.
2060	USØ2 SAMPLE LOCATION. LOOKING N.
2061	SPØ3/SP903 SAMPLE LOC. LOOKING NE.
2062	" " " " " "
2063	BKGDØ7 SAMPLE LOC. LOOKING NE.
2064	" " " LOOKING E.
2065	" " " LOOKING NE.

CH2MHILL

PROJECT NUMBER	DATE	SHEET
652441.F1.05	3/21/16	3 OF 3

PHOTOGRAPH LOG

PROJECT: WARM HOUSE BEACH DUMP SITE LOCATION: NEAY BAY, WA
EVENT 1

PHOTO NO.	SCENE DESCRIPTION
2066	~~SOØ9~~ SAMPLE LOC. LOOKING NE.
2067	" " " " "
2068	BKGDØ8 SAMPLE LOC. LOOKING SE.
2069	SPØ2 SAMPLE LOC. LOOKING SW.
2070	BKGD-Ø2 SAMPLE LOC. LOOKING SW.
2071	BKGD-Ø3 SAMPLE LOC. LOOKING SW.
2072	BKGD-1Ø SAMPLE LOC LOOKING SE.
2073	BKGD-Ø5 SAMPLE LOC. LOOKING E.
2074	BKGD-Ø4 SAMPLE LOC LOOKING E.
2075	" " " " " "
4421	SP-Ø1 SAMPLE LOCATION DRY, LOOKING W.
4422	SP-Ø1 SAMPLE LOCATION DRY, LOOKING W.


3/16/16
EC-03
2016WB1-SW-EC03
11:15
#2016
Appendix B
Field Sampling Plan

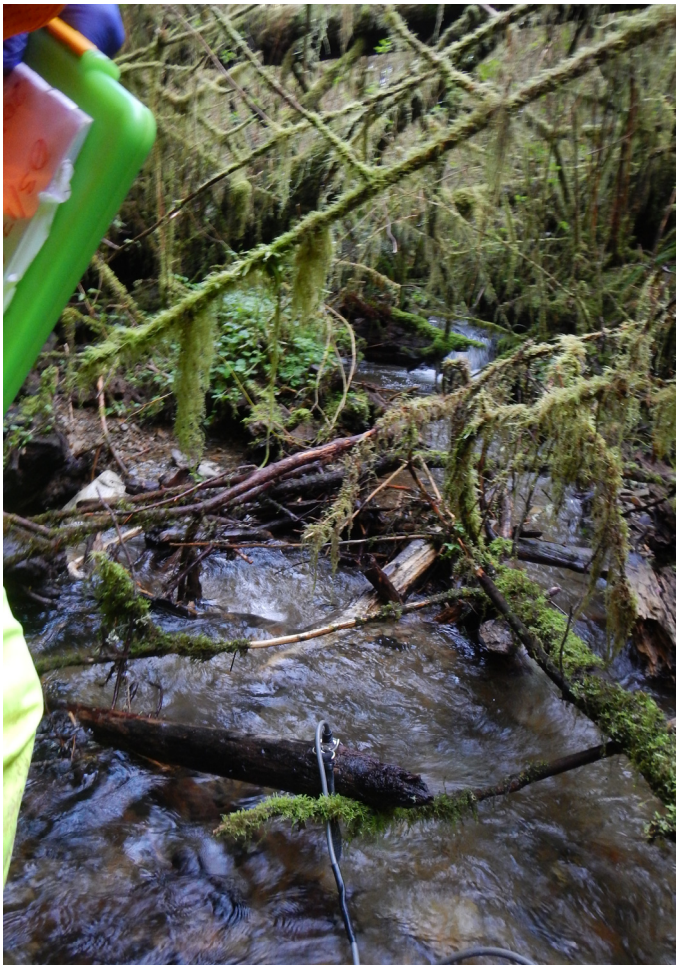

3/16/16
EC-02 12:30
EC-902 12:45
#2020


5/16/16
1515
-2016WB1-SW-KC-01
photo # 2023


03/17/16
EC-01
2016WB1-SW-EC-01
15:45
#2030


03/17/16
BKGD-01
2016WB1-SW-BKGD-01
14:40
#2027


03/17/16
BKGD-01
2016WB1-SW-BKGD-01
14:40
#2027




03/17/16
EC
SW EC-101
15 45
#2030


3/16/16 16:00
2016 WBI-SW-WC-01
2044

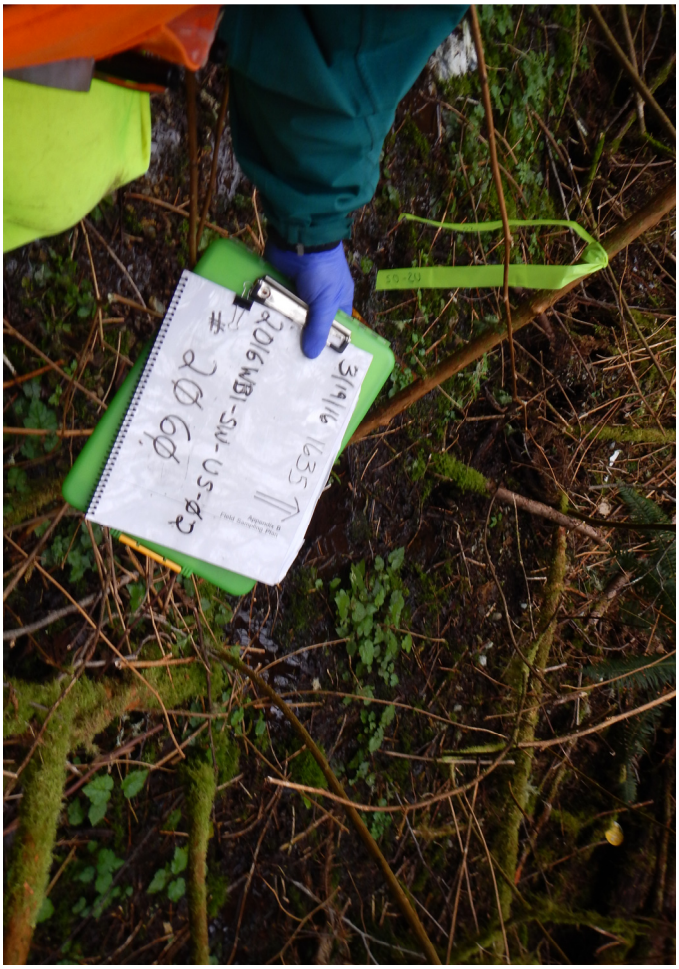

3/16/16
2016-WBI-SW-WC-04
12:30
2043


3/16/16
2016-WBI-SW-WC-04
12:30
2043


3/16/16
2016-WBI-SW-WC-04
12:30
2043


3/16/16
2016-WB1-SW-WC-03
13:30
2035

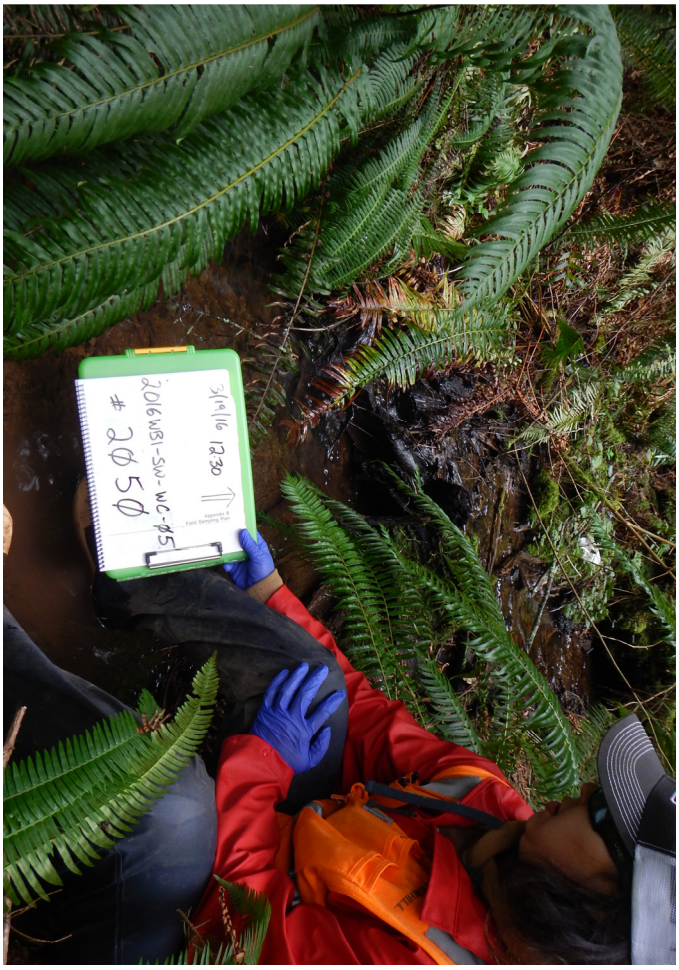

3/16/16
2016-WB1-SW-WC-03
13:30
2035


3/19/16 1435
2016WB1-SW-SP-Ø3
2Ø46


2016WB1-SW-SP-Ø3
2Ø47


3/19/16 10:10
2016WB1-SW-NC-Ø2
2Ø48


3/19/16 11:15
2016WB1-SW-SP-Ø4
2Ø49


3/19/16 1230
2016WB1-SW-WC-Ø5
2Ø5Ø


3/19/16 1230
2016WB1-SW-WC-Ø5
2Ø5Ø


3/19/16 15ØØ
2016WB1-SW-USB-Ø1
2Ø55

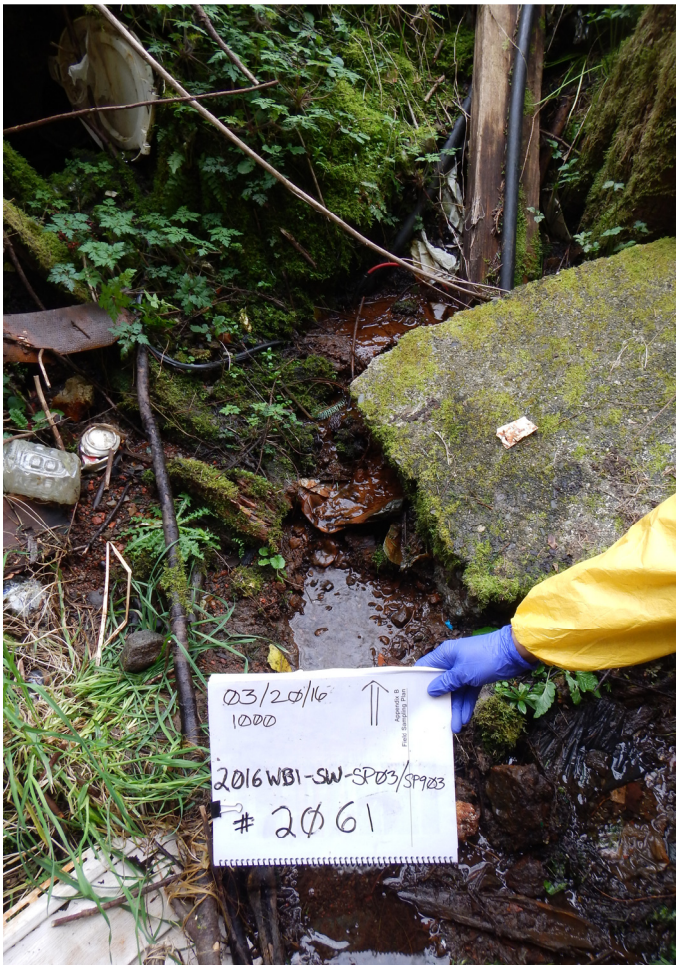

3/19/16 15ØØ
2016WB1-SW-USB-Ø1
2Ø55

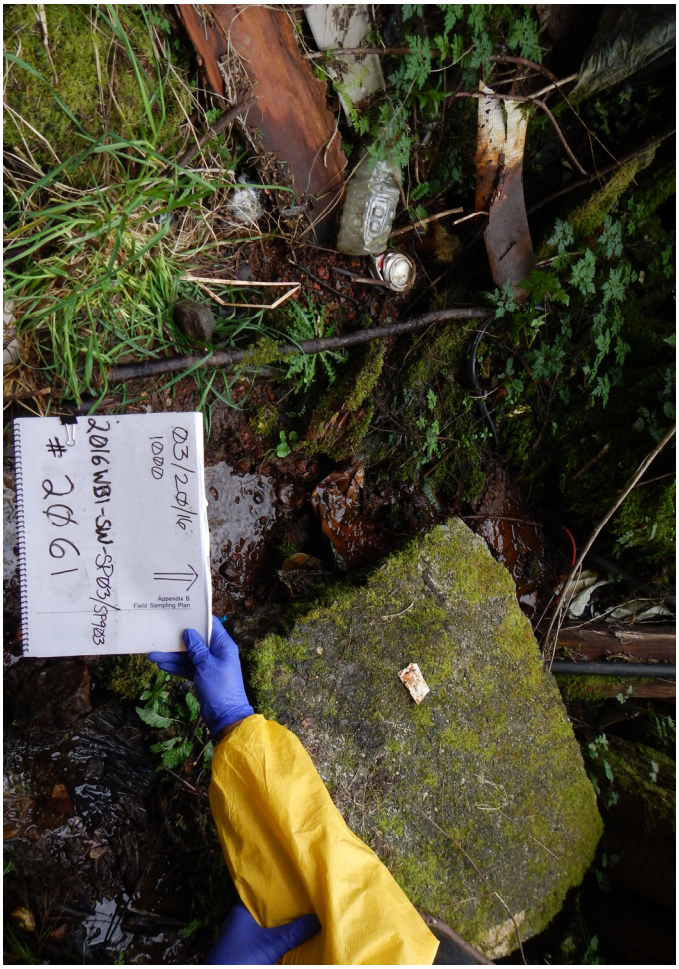

3/19/16 1500
2016WB1-SW-USB-01
2055


3/19/16 1635
2016WB1-SW-SP-05
2058


3/19/16 1635
2016WB1-SW-SP-05
2059
Appendix B
Field Sampling Plan


03/20/16
1130
2016WB1-SW-BKGD-ΦΔ
2068

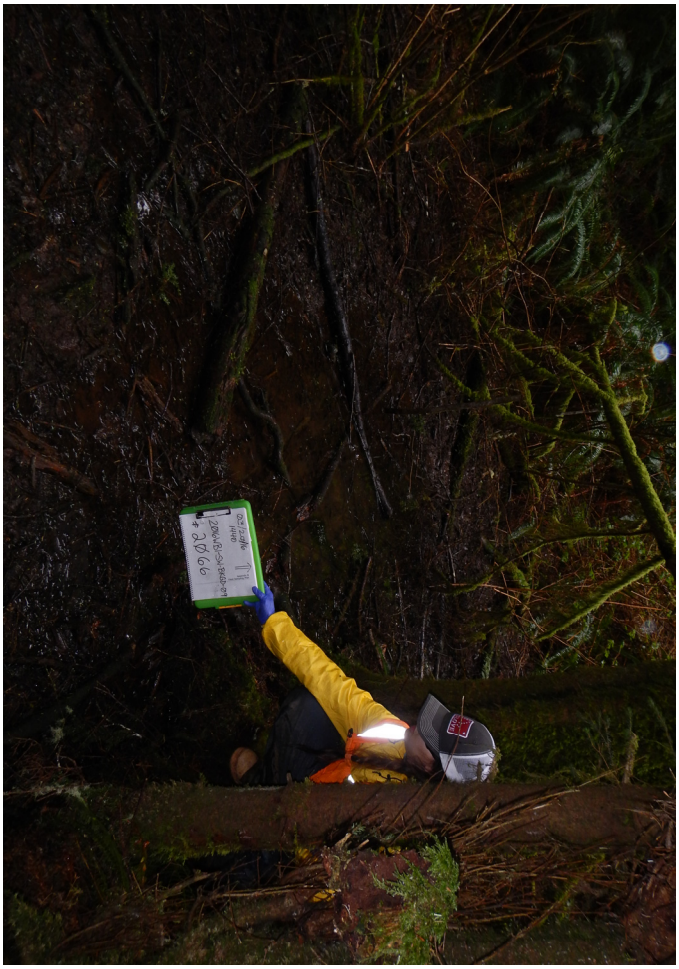

03/20/16
1000
2016 WB1-SW-SP03/SP903
2061


03/20/16
1000
2016 WB1-SW-SP03/SP903
2061


03/20/16
12:45
2016 WB1-SW-BKGD-ΦΔ
2063


03/20/16
12:45
Appendix B
Field Sampling Plan
2016WB1-SW-BKGD-07
#2063


03/20/16
12:45
Appendix B
Field Sampling Plan
2016WB1-SW-BKGD-07
#2063



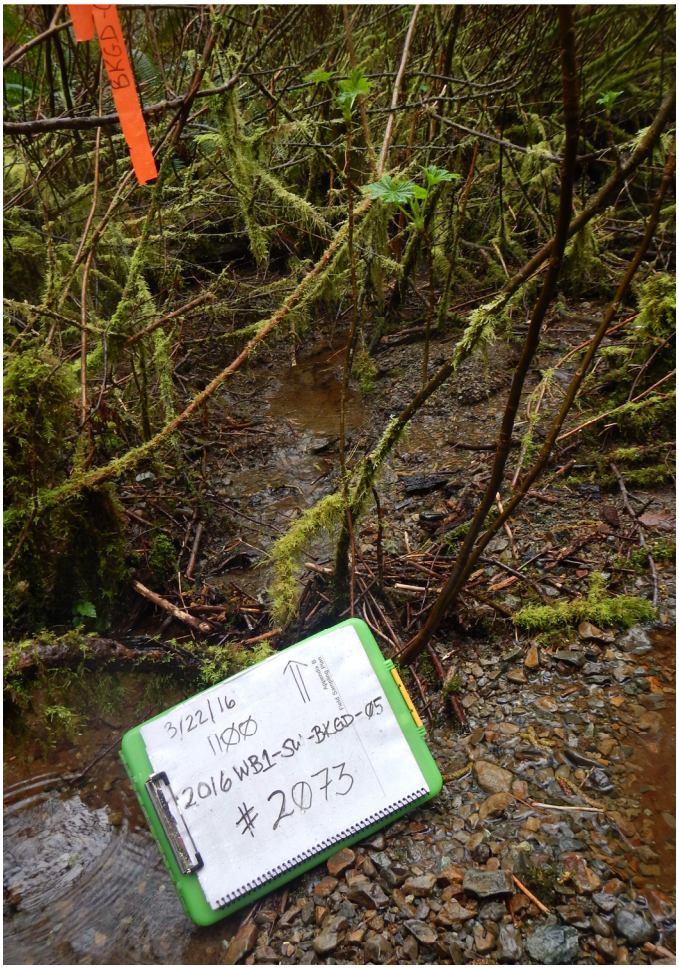

3/21/16
1325
2016WBI-SW-SP-02
#2074


03/21/16
1325
2016WBI-SW-SP-02
+FD
#2069


03/21/16
1500
#2070


3/21/16
1600
2016 WBI-SW-BKGD-03
#2071


2016 WB1-SW-BKGD-10
#2072


3/22/16
1100
2016 WB1-SW-BKGD-05
#2073


2016 WB1-S-BKGD-QS
2073


2016 WB1-S-BKGD-QS
2074


03/22/13
SP-01
DRY

Chains of Custody

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-031116-105527-0001

DateShipped: 3/17/2016

CarrierName: FedEx

AirbillNo: 782613139822

Case #: 46044

Cooler #: 2

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114121	MJHB21	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	KC-01	03/16/2016 15:15	
16114122	MJHB22	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	KC-01	03/16/2016 15:15	
16114127	MJHB23	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	KC-02	03/16/2016 16:00	
16114128	MJHB28	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	KC-02	03/16/2016 16:00	

Special Instructions:

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) **CHAIN OF CUSTODY RECORD** **No: 10-031116-105752-0002**

DateShipped: 3/17/2016 Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx Case #: 46044 Lab Contact: Roxy Olson

AirbillNo: 782613137543 Cooler #: 2 Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114100	JHB10	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	B (HCl pH <2), C (HCl pH <2), D (HCl pH <2), E (HCl pH <2), F (HCl pH <2) (5)	US-01	03/15/2016 15:40	
16114112	JHB14	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	B (HCl pH <2), C (HCl pH <2), D (HCl pH <2), E (HCl pH <2), F (HCl pH <2) (5)	EC-02	03/16/2016 12:30	
16114108	JHB15	Water/ Mark Endo	Grab	TVOA+SIM(21)	A (HCl pH <2) (2)	TB-01	03/15/2016 09:00	
16114115	JHB17	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	B (HCl pH <2), C (HCl pH <2), D (HCl pH <2), E (HCl pH <2), F (HCl pH <2) (5)	EC-02	03/16/2016 12:45	
16114118	JHB19	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	B (HCl pH <2), C (HCl pH <2), D (HCl pH <2), E (HCl pH <2), F (HCl pH <2) (5)	EC-03	03/16/2016 11:15	
16114121	JHB21	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	B (HCl pH <2), C (HCl pH <2), D (HCl pH <2), E (HCl pH <2), F (HCl pH <2) (5)	KC-01	03/16/2016 15:15	
16114127	JHB23	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21), SVOC+SIM(21)	B (HCl pH <2), C (HCl pH <2), D (HCl pH <2), E (HCl pH <2), F (HCl pH <2), G (< 6 C), H (< 6 C) (7)	KC-02	03/16/2016 16:00	

Sample(s) to be used for Lab QC: 16114108 Tag A, 16114103 Tag D, 16114103 Tag E, 16114103 Tag E1, 16114103 Tag E2, 16114103 Tag F, 16114103 Tag F1, 16114103 Tag F2, 16114103 Tag G, 16114103 Tag G1, 16114103 Tag G2, 16114103 Tag H, 16114103 Tag H1, 16114103 Tag H2

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TVOA+SIM=TVOA TCL + VOC SIM MA 2454.2, SVOC+SIM=SVOC TCL + PAH SIM

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) | **CHAIN OF CUSTODY RECORD** | **No: 10-031116-105752-0002**

DateShipped: 3/17/2016 | Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx | Case #: 46044 | Lab Contact: Roxy Olson

AirbillNo: 782613137543 | Cooler #: 2 | Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114103	JHB24	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	D (HCl pH <2), D1 (HCl pH <2), D2 (HCl pH <2), E (HCl pH <2), E1 (HCl pH <2), E2 (HCl pH <2), F (HCl pH <2), F1 (HCl pH <2), F2 (HCl pH <2), G (HCl pH <2), G1 (HCl pH <2), G2 (HCl pH <2), H (HCl pH <2), H1 (HCl pH <2), H2 (HCl pH <2) (15)	WC-06	03/15/2016 14:30	
16114124	JHB26	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	B (HCl pH <2), C (HCl pH <2), D (HCl pH <2), E (HCl pH <2), F (HCl pH <2) (5)	BKGD-01	03/15/2016 13:26	
16114133	JHB31	Water/ Mark Endo	Grab	TVOA+SIM(21)	A (HCl pH <2) (2)	TB-02	03/16/2016 09:00	

Sample(s) to be used for Lab QC: 16114103 Tag H2, 16114133 Tag A

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TVOA+SIM=TVOA TCL + VOC SIM MA 2454.2, SVOC+SIM=SVOC TCL + PAH SIM

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

EPA R10 Lab (MEL) COC (REGION COPY)

DateShipped: 3/17/2016
CarrierName: FedEx
AirbillNo: 782613066249

CHAIN OF CUSTODY RECORD

Warmhouse Beach Dump RI-FS/WA
Project Code: SFP-095A
Cooler #: 1

No: 10-031116-110227-0004

2016T10P303DD210HVLA00
Contact Name: Brittany Prentice
Contact Phone: 253-335-1661

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
16114102		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	US-01	03/15/2016 15:40	Field Sample
16114105		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C), N2 (< 6 C), N3 (< 6 C) (3)	WC-06	03/15/2016 14:30	Field Sample
16114106		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	FB-01	03/15/2016 20:00	QC Blank - Field
16114114		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	EC-02	03/16/2016 12:30	Field Sample
16114117		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	EC-02	03/16/2016 12:45	Field Duplicate
16114120		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	EC-03	03/16/2016 11:15	Field Sample
16114123		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	KC-01	03/16/2016 15:15	Field Sample
16114126		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	BKGD-01	03/15/2016 13:26	Field Sample

Sample(s) to be used for Lab QC: 16114105 Tag N1, 16114105 Tag N2, 16114105 Tag N3	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: ClO4=Perchlorate	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

EPA R10 Lab (MEL) COC (REGION COPY)

DateShipped: 3/17/2016
CarrierName: FedEx
AirbillNo: 782613066249

CHAIN OF CUSTODY RECORD

Warmhouse Beach Dump RI-FS/WA
Project Code: SFP-095A
Cooler #: 1

No: 10-031116-110227-0004

2016T10P303DD210HVLA00
Contact Name: Brittany Prentice
Contact Phone: 253-335-1661

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
16114129		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	KC-02	03/16/2016 16:00	Field Sample

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: ClO4=Perchlorate	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) | **CHAIN OF CUSTODY RECORD** | **No: 10-031716-051944-0005**

DateShipped: 3/17/2016 | Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx | Case #: 46044 | Lab Contact: Roxy Olson

AirbillNo: 782613139822 | Cooler #: 2 | Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114121	JHB21	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (4)	KC-01	03/16/2016 15:15	
16114127	JHB23	Surface Water Total/ Mark Endo	Grab	PEST(21)	I (< 6 C), J (< 6 C) (2)	KC-02	03/16/2016 16:00	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) **CHAIN OF CUSTODY RECORD** **No: 10-031716-052635-0006**

DateShipped: 3/17/2016 Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx Case #: 46044 Lab Contact: Roxy Olson

AirbillNo: 782613143906 Cooler #: 3 Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114112	JHB14	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (4)	EC-02	03/16/2016 12:30	
16114115	JHB17	Surface Water Total/ Mark Endo	Grab	PEST(21)	I (< 6 C), J (< 6 C) (2)	EC-02	03/16/2016 12:45	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-031716-052924-0007

DateShipped: 3/17/2016

CarrierName: FedEx

AirbillNo: 782613143906

Case #: 46044

Cooler #: 3

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114112	MJHB14	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	EC-02	03/16/2016 12:30	
16114113	MJHB16	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	EC-02	03/16/2016 12:30	
16114115	MJHB17	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	EC-02	03/16/2016 12:45	
16114116	MJHB18	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	EC-02	03/16/2016 12:45	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) **CHAIN OF CUSTODY RECORD** **No: 10-031716-053210-0008**

DateShipped: 3/17/2016 Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx Case #: 46044 Lab Contact: Roxy Olson

AirbillNo: 782613146206 Cooler #: 4 Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114115	JHB17	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21)	G (< 6 C), H (< 6 C) (2)	EC-02	03/16/2016 12:45	
16114118	JHB19	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (4)	EC-03	03/16/2016 11:15	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) **CHAIN OF CUSTODY RECORD** **No: 10-031716-053444-0009**

DateShipped: 3/17/2016 Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx Case #: 46044 Lab Contact: Roxy Olson

AirbillNo: 782613146206 Cooler #: 4 Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114118	MJHB19	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	EC-03	03/16/2016 11:15	
16114119	MJHB20	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	EC-03	03/16/2016 11:15	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-031716-053725-0010

DateShipped: 3/17/2016

CarrierName: FedEx

AirbillNo: 782613148779

Case #: 46044

Cooler #: 5

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114103	JHB24	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21)	I (< 6 C), J (< 6 C), K (< 6 C), L (< 6 C), M (< 6 C), N (< 6 C) (6)	WC-06	03/15/2016 14:30	

Sample(s) to be used for Lab QC: 16114103 Tag I, 16114103 Tag J, 16114103 Tag K, 16114103 Tag L, 16114103 Tag M, 16114103 Tag N

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-031716-053921-0011

DateShipped: 3/17/2016

CarrierName: FedEx

AirbillNo: 782613148779

Case #: 46044

Cooler #: 5

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114104	MJHB25	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2), B (HNO3 pH<2), C (HNO3 pH<2) (3)	WC-06	03/15/2016 14:30	

Sample(s) to be used for Lab QC: 16114104 Tag A, 16114104 Tag B, 16114104 Tag C	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-031716-054216-0012

DateShipped: 3/17/2016

CarrierName: FedEx

AirbillNo: 782613164135

Case #: 46044

Cooler #: 6

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114103	JHB24	Surface Water Total/ Mark Endo	Grab	PEST(21)	O (< 6 C), P (< 6 C), Q (< 6 C), R (< 6 C), S (< 6 C), T (< 6 C) (6)	WC-06	03/15/2016 14:30	

Sample(s) to be used for Lab QC: 16114103 Tag O, 16114103 Tag P, 16114103 Tag Q, 16114103 Tag R, 16114103 Tag S, 16114103 Tag T

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: PEST=Pesticides TCL

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-031716-054350-0013

DateShipped: 3/17/2016

CarrierName: FedEx

AirbillNo: 782613164135

Case #: 46044

Cooler #: 6

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114103	MJHB24	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	A (HNO3 pH<2), B (HNO3 pH<2), C (HNO3 pH<2) (3)	WC-06	03/15/2016 14:30	

Sample(s) to be used for Lab QC: 16114103 Tag A, 16114103 Tag B, 16114103 Tag C

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) **CHAIN OF CUSTODY RECORD** **No: 10-031716-054532-0014**

DateShipped: 3/17/2016 Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx Case #: 46044 Lab Contact: Roxy Olson

AirbillNo: 782613165337 Cooler #: 7 Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114124	JHB26	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (4)	BKGD-01	03/15/2016 13:26	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-031716-054734-0015

DateShipped: 3/17/2016

CarrierName: FedEx

AirbillNo: 782613165337

Case #: 46044

Cooler #: 7

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114107	MJHB15	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	FB-02	03/15/2016 20:30	
16114124	MJHB26	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	BKGD-01	03/15/2016 13:26	
16114125	MJHB27	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	BKGD-01	03/15/2016 13:26	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg, TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) **CHAIN OF CUSTODY RECORD** **No: 10-031716-055014-0016**

DateShipped: 3/17/2016 Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx Case #: 46044 Lab Contact: Roxy Olson

AirbillNo: 782613165705 Cooler #: 8 Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114100	JHB10	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (4)	US-01	03/15/2016 15:40	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) **CHAIN OF CUSTODY RECORD** **No: 10-031716-055147-0017**

DateShipped: 3/17/2016 Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx Case #: 46044 Lab Contact: Roxy Olson

AirbillNo: 782613165705 Cooler #: 8 Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114100	MJHB10	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	US-01	03/15/2016 15:40	
16114101	MJHB11	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	US-01	03/15/2016 15:40	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/18/2016
CarrierName: FedEx
AirbillNo: 782621780607

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 9

No: 10-031716-195714-0018

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114109	JHB12	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	B (HCl pH <2), C (HCl pH <2), D (HCl pH <2), E (HCl pH <2), F (HCl pH <2) (5)	EC-01	03/17/2016 15:45	
16114130	JHB29	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21), SVOC+SIM(21), PEST(21)	B (HCl pH <2), C (HCl pH <2), D (HCl pH <2), E (HCl pH <2), F (HCl pH <2), G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (9)	BKGD-06	03/17/2016 14:40	
16114134	JHB32	Water/ Mark Endo	Grab	TVOA+SIM(21)	A (HCl pH <2), B (HCl pH <2) (2)	TB-03	03/17/2016 10:00	

Sample(s) to be used for Lab QC: 16114134 Tag A, 16114134 Tag B

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TVOA+SIM=TVOA TCL + VOC SIM MA 2454.2, SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-031716-200626-0019

DateShipped: 3/18/2016
CarrierName: FedEx
AirbillNo: 782621780607

Case #: 46044
Cooler #: 9

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114130	MJHB29	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	BKGD-06	03/17/2016 14:40	
16114131	MJHB30	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	BKGD-06	03/17/2016 14:40	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/18/2016
CarrierName: FedEx
AirbillNo: 782621783786

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 10

No: 10-031716-201856-0020

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114109	JHB12	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	G (< 6 C), H (< 6 C), I (< 6 C), J (< 6 C) (4)	EC-01	03/17/2016 15:45	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/18/2016
CarrierName: FedEx
AirbillNo: 782621783786

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 10

No: 10-031716-202035-0021

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114109	MJHB12	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	EC-01	03/17/2016 15:45	
16114110	MJHB13	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	A (HNO3 pH<2) (1)	EC-01	03/17/2016 15:45	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-032116-054543-0022

DateShipped: 3/21/2016

CarrierName: FedEx

AirbillNo: 782635523520

Case #: 46044

Cooler #: 11

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114135	JHB33	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1013 (< 6 C), 1015 (< 6 C), 1017 (< 6 C), 1019 (< 6 C) (4)	WC-01	03/18/2016 16:00	
16114138	JHB35	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21)	1028 (< 6 C), 1029 (< 6 C) (2)	WC-03	03/18/2016 13:30	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) **CHAIN OF CUSTODY RECORD** **No: 10-032116-054742-0023**

DateShipped: 3/21/2016 Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx Case #: 46044 Lab Contact: Roxy Olson

AirbillNo: 782635523520 Cooler #: 11 Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114135	MJHB33	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1001 (HNO3 pH<2) (1)	WC-01	03/18/2016 16:00	
16114136	MJHB34	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1021 (HNO3 pH<2) (1)	WC-01	03/18/2016 16:00	
16114138	MJHB35	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1022 (HNO3 pH<2) (1)	WC-03	03/18/2016 13:30	
16114139	MJHB36	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1032 (HNO3 pH<2) (1)	WC-03	03/18/2016 13:30	
16114141	MJHB37	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1033 (HNO3 pH<2) (1)	WC-04	03/18/2016 12:30	
16114142	MJHB38	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1043 (HNO3 pH<2) (1)	WC-04	03/18/2016 12:30	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY) **CHAIN OF CUSTODY RECORD** **No: 10-032116-060407-0024**

DateShipped: 3/21/2016 Lab: ALS Laboratory Group - Salt Lake City

CarrierName: FedEx Case #: 46044 Lab Contact: Roxy Olson

AirbillNo: 782635603083 Cooler #: 12 Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114138	JHB35	Surface Water Total/ Mark Endo	Grab	PEST(21)	1030 (< 6 C), 1031 (< 6 C) (2)	WC-03	03/18/2016 13:30	
16114141	JHB37	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1039 (< 6 C), 1040 (< 6 C), 1041 (< 6 C), 1042 (< 6 C) (4)	WC-04	03/18/2016 12:30	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: PEST=Pesticides TCL, SVOC+SIM=SVOC TCL + PAH SIM	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-032116-060541-0025

DateShipped: 3/21/2016

CarrierName: FedEx

AirbillNo: 782635626533

Case #: 46044

Cooler #: 13

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114157	MJHB48	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1104 (HNO3 pH<2) (1)	USB-01	03/19/2016 15:00	
16114158	MJHB49	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1124 (HNO3 pH<2) (1)	USB-01	03/19/2016 15:00	
16114160	MJHB50	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1125 (HNO3 pH<2) (1)	SP-05	03/19/2016 16:35	
16114161	MJHB51	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1135 (HNO3 pH<2) (1)	SP-05	03/19/2016 16:35	

Special Instructions:

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782635626533

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 13

No: 10-032116-061518-0026

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114157	JHB48	Surface Water Total/ Mark Endo	Grab	PEST(21)	1120 (< 6 C), 1122 (< 6 C) (2)	USB-01	03/19/2016 15:00	
16114160	JHB50	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1131 (< 6 C), 1132 (< 6 C), 1133 (< 6 C), 1134 (< 6 C) (4)	SP-05	03/19/2016 16:35	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: PEST=Pesticides TCL, SVOC+SIM=SVOC TCL + PAH SIM	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636013420

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 14

No: 10-032116-064248-0027

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114135	JHB33	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1003 (HCl pH <2), 1005 (HCl pH <2), 1007 (HCl pH <2), 1009 (HCl pH <2), 1011 (HCl pH <2) (5)	WC-01	03/18/2016 16:00	
16114138	JHB35	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1023 (HCl pH <2), 1024 (HCl pH <2), 1025 (HCl pH <2), 1026 (HCl pH <2), 1027 (HCl pH <2) (5)	WC-03	03/18/2016 13:30	
16114141	JHB37	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1034 (HCl pH <2), 1035 (HCl pH <2), 1036 (HCl pH <2), 1037 (HCl pH <2), 1038 (HCl pH <2) (5)	WC-04	03/18/2016 12:30	
16114144	JHB39	Water/ Mark Endo	Grab	TVOA+SIM(21)	1045 (HCl pH <2), 1047 (HCl pH <2) (2)	TB-04	03/18/2016 09:00	
16114145	JHB40	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1049 (HCl pH <2), 1050 (HCl pH <2), 1051 (HCl pH <2), 1052 (HCl pH <2), 1053 (HCl pH <2) (5)	WC-05	03/19/2016 12:30	
16114148	JHB42	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1060 (HCl pH <2), 1061 (HCl pH <2), 1062 (HCl pH <2), 1063 (HCl pH <2), 1064 (HCl pH <2) (5)	WC-02	03/19/2016 10:10	

Sample(s) to be used for Lab QC: 16114144 Tag 1045, 16114144 Tag 1047	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: TVOA+SIM=TVOA TCL + VOC SIM MA 2454.2	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636013420

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 14

No: 10-032116-064248-0027

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114151	JHB44	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1071 (HCl pH <2), 1072 (HCl pH <2), 1073 (HCl pH <2), 1074 (HCl pH <2), 1075 (HCl pH <2) (5)	SP-04	03/19/2016 11:15	
16114154	JHB46	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1084 (HCl pH <2), 1086 (HCl pH <2), 1088 (HCl pH <2), 1090 (HCl pH <2), 1092 (HCl pH <2) (5)	US-02	03/19/2016 15:00	
16114157	JHB48	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1106 (HCl pH <2), 1108 (HCl pH <2), 1110 (HCl pH <2), 1112 (HCl pH <2), 1114 (HCl pH <2) (5)	USB-01	03/19/2016 15:00	
16114160	JHB50	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1126 (HCl pH <2), 1127 (HCl pH <2), 1128 (HCl pH <2), 1129 (HCl pH <2), 1130 (HCl pH <2) (5)	SP-05	03/19/2016 16:35	
16114163	JHB52	Water/ Mark Endo	Grab	TVOA+SIM(21)	1136 (HCl pH <2), 1137 (HCl pH <2) (2)	TB-05	03/19/2016 09:00	

Sample(s) to be used for Lab QC: 16114163 Tag 1136, 16114163 Tag 1137	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: TVOA+SIM=TVOA TCL + VOC SIM MA 2454.2	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636101315

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 15

No: 10-032116-065232-0028

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114154	JHB46	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1094 (< 6 C), 1096 (< 6 C), 1098 (< 6 C), 1100 (< 6 C) (4)	US-02	03/19/2016 15:00	
16114157	JHB48	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21)	1116 (< 6 C), 1118 (< 6 C) (2)	USB-01	03/19/2016 15:00	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016

CarrierName: FedEx

AirbillNo: 782636101315

CHAIN OF CUSTODY RECORD

Case #: 46044

Cooler #: 14

No: 10-032116-065343-0029

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114154	MJHB46	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1082 (HNO3 pH<2) (1)	US-02	03/19/2016 15:00	
16114155	MJHB47	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1102 (HNO3 pH<2) (1)	US-02	03/19/2016 15:00	

Special Instructions:

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636143664

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 16

No: 10-032116-065906-0030

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114148	JHB42	Surface Water Total/ Mark Endo	Grab	PEST(21)	1067 (< 6 C), 1068 (< 6 C) (2)	WC-02	03/19/2016 10:10	
16114151	JHB44	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1076 (< 6 C), 1077 (< 6 C), 1078 (< 6 C), 1079 (< 6 C) (4)	SP-04	03/19/2016 11:15	

Special Instructions:

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: PEST=Pesticides TCL, SVOC+SIM=SVOC TCL + PAH SIM

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016

CarrierName: FedEx

AirbillNo: 782636143664

CHAIN OF CUSTODY RECORD

Case #: 46044

Cooler #: 16

No: 10-032116-070218-0031

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114151	MJHB44	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1070 (HNO3 pH<2) (1)	SP-04	03/19/2016 11:15	
16114152	MJHB45	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1080 (HNO3 pH<2) (1)	SP-04	03/19/2016 11:15	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

CHAIN OF CUSTODY RECORD

No: 10-032116-070918-0032

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636242708

Case #: 46044
Cooler #: 17

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114145	JHB40	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1054 (< 6 C), 1055 (< 6 C), 1056 (< 6 C), 1057 (< 6 C) (4)	WC-05	03/19/2016 12:30	
16114148	JHB42	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21)	1065 (< 6 C), 1066 (< 6 C) (2)	WC-02	03/19/2016 10:10	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636242708

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 17

No: 10-032116-071037-0033

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16114145	MJHB40	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1048 (HNO3 pH<2) (1)	WC-05	03/19/2016 12:30	
16114146	MJHB41	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1058 (HNO3 pH<2) (1)	WC-05	03/19/2016 12:30	
16114148	MJHB42	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1059 (HNO3 pH<2) (1)	WC-02	03/19/2016 10:10	
16114149	MJHB43	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1069 (HNO3 pH<2) (1)	WC-02	03/19/2016 10:10	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016

CarrierName: FedEx

AirbillNo: 782636316850

CHAIN OF CUSTODY RECORD

Case #: 46044

Cooler #: 18

No: 10-032116-071516-0034

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124100	JHB53	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1144 (< 6 C), 1145 (< 6 C), 1146 (< 6 C), 1147 (< 6 C) (4)	SP-03	03/20/2016 10:00	
16124103	JHB55	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21)	1155 (< 6 C), 1156 (< 6 C) (2)	SP-903	03/20/2016 10:30	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636316850

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 18

No: 10-032116-071715-0035

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124100	MJHB53	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1138 (HNO3 pH<2) (1)	SP-03	03/20/2016 10:00	
16124101	MJHB54	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1148 (HNO3 pH<2) (1)	SP-03	03/20/2016 10:00	
16124103	MJHB55	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1149 (HNO3 pH<2) (1)	SP-903	03/20/2016 10:30	
16124104	MJHB56	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1159 (HNO3 pH<2) (1)	SP-903	03/20/2016 10:30	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636392370

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 19

No: 10-032116-072042-0036

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124100	JHB53	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1139 (HCl pH <2), 1140 (HCl pH <2), 1141 (HCl pH <2), 1142 (HCl pH <2), 1143 (HCl pH <2) (5)	SP-03	03/20/2016 10:00	
16124103	JHB55	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1150 (HCl pH <2), 1151 (HCl pH <2), 1152 (HCl pH <2), 1153 (HCl pH <2), 1154 (HCl pH <2) (5)	SP-903	03/20/2016 10:30	
16124106	JHB57	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1167 (HCl pH <2), 1169 (HCl pH <2), 1171 (HCl pH <2), 1173 (HCl pH <2), 1175 (HCl pH <2), 1177 (HCl pH <2), 1179 (HCl pH <2), 1181 (HCl pH <2), 1183 (HCl pH <2), 1185 (HCl pH <2), 1187 (HCl pH <2), 1189 (HCl pH <2), 1191 (HCl pH <2), 1193 (HCl pH <2), 1195 (HCl pH <2) (15)	BKGD-07	03/20/2016 12:45	
16124109	JHB59	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21), SVOC+SIM(21), PEST(21)	1229 (HCl pH <2), 1231 (HCl pH <2), 1233 (HCl pH <2), 1235 (HCl pH <2), 1237 (HCl pH <2), 1239 (< 6 C), 1241 (< 6 C), 1243 (< 6 C), 1245 (< 6 C) (9)	BKGD-08	03/20/2016 15:30	

Sample(s) to be used for Lab QC: 16124106 Tag 1167, 16124106 Tag 1169, 16124106 Tag 1171, 16124106 Tag 1173, 16124106 Tag 1175, 16124106 Tag 1177, 16124106 Tag 1179, 16124106 Tag 1181, 16124106 Tag 1183, 16124106 Tag 1185, 16124106 Tag 1187, 16124106 Tag 1189, 16124106 Tag 1191, 16124106 Tag 1193, 16124106 Tag 1195

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TVOA+SIM=TVOA TCL + VOC SIM MA 2454.2, SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636392370

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 19

No: 10-032116-072042-0036

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124112	JHB61	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1251 (HCl pH <2), 1253 (HCl pH <2), 1255 (HCl pH <2), 1257 (HCl pH <2), 1259 (HCl pH <2) (5)	BKGD-09	03/20/2016 14:40	
16124115	JHB63	Water/ Mark Endo	Grab	TVOA+SIM(21)	1270 (HCl pH <2), 1271 (HCl pH <2) (2)	TB-06	03/20/2016 09:00	

Sample(s) to be used for Lab QC: 16124115 Tag 1270, 16124115 Tag 1271

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TVOA+SIM=TVOA TCL + VOC SIM MA 2454.2, SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016

CarrierName: FedEx

AirbillNo: 782636392370

CHAIN OF CUSTODY RECORD

Case #: 46044

Cooler #: 19

No: 10-032116-073554-0037

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124109	MJHB59	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1227 (HNO3 pH<2) (1)	BKGD-08	03/20/2016 15:30	
16124110	MJHB60	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1247 (HNO3 pH<2) (1)	BKGD-08	03/20/2016 15:30	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636726186

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 20

No: 10-032116-074347-0038

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124103	JHB55	Surface Water Total/ Mark Endo	Grab	PEST(21)	1157 (< 6 C), 1158 (< 6 C) (2)	SP-903	03/20/2016 10:30	
16124112	JHB61	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1261 (< 6 C), 1263 (< 6 C), 1265 (< 6 C), 1267 (< 6 C) (4)	BKGD-09	03/20/2016 14:40	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: PEST=Pesticides TCL, SVOC+SIM=SVOC TCL + PAH SIM	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636726186

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 20

No: 10-032116-074537-0039

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124112	MJHB61	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1249 (HNO3 pH<2) (1)	BKGD-09	03/20/2016 14:40	
16124113	MJHB62	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1269 (HNO3 pH<2) (1)	BKGD-09	03/20/2016 14:40	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016

CarrierName: FedEx

AirbillNo: 782636805721

CHAIN OF CUSTODY RECORD

Case #: 46044

Cooler #: 21

No: 10-032116-075656-0040

Lab: ALS Laboratory Group - Salt Lake City

Lab Contact: Roxy Olson

Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124106	JHB57	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21)	1197 (< 6 C), 1199 (< 6 C), 1201 (< 6 C), 1203 (< 6 C), 1205 (< 6 C), 1207 (< 6 C) (6)	BKGD-07	03/20/2016 12:45	

Sample(s) to be used for Lab QC: 16124106 Tag 1197, 16124106 Tag 1199, 16124106 Tag 1201, 16124106 Tag 1203, 16124106 Tag 1205, 16124106 Tag 1207

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782636805721

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 21

No: 10-032116-075900-0041

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124106	MJHB57	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1161 (HNO3 pH<2), 1163 (HNO3 pH<2), 1165 (HNO3 pH<2) (3)	BKGD-07	03/20/2016 12:45	

Sample(s) to be used for Lab QC: 16124106 Tag 1161, 16124106 Tag 1163, 16124106 Tag 1165

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782637010769

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 22

No: 10-032116-080324-0042

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124106	JHB57	Surface Water Total/ Mark Endo	Grab	PEST(21)	1209 (< 6 C), 1211 (< 6 C), 1213 (< 6 C), 1215 (< 6 C), 1217 (< 6 C), 1219 (< 6 C) (6)	BKGD-07	03/20/2016 12:45	

Sample(s) to be used for Lab QC: 16124106 Tag 1209, 16124106 Tag 1211, 16124106 Tag 1213, 16124106 Tag 1215, 16124106 Tag 1217, 16124106 Tag 1219

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: PEST=Pesticides TCL

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/21/2016
CarrierName: FedEx
AirbillNo: 782637010769

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 22

No: 10-032116-080459-0043

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124107	MJHB58	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1221 (HNO3 pH<2), 1223 (HNO3 pH<2), 1225 (HNO3 pH<2) (3)	BKGD-07	03/20/2016 12:45	

Sample(s) to be used for Lab QC: 16124107 Tag 1221, 16124107 Tag 1223, 16124107 Tag 1225

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

EPA R10 Lab (MEL) COC (REGION COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645339650

CHAIN OF CUSTODY RECORD

Warmhouse Beach Dump RI-FS/WA
Project Code: SFP-095A
Cooler #: 2

No: 10-032116-194358-0044

2016T10P303DD210HVLA00
Contact Name: Brittany Prentice
Contact Phone: 253-335-1661

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
16124118		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	SP-02	03/21/2016 13:25	Field Sample
16124121		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	SP-902	03/21/2016 14:00	Field Duplicate
16124125		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	BKGD-02	03/21/2016 15:00	Field Sample
16124128		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	BKGD-03	03/21/2016 16:00	Field Sample
16124131		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	BKGD-10	03/21/2016 16:50	Field Sample
16114111		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	EC-01	03/17/2016 15:45	Field Sample
16114132		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	BKGD-06	03/17/2016 14:40	Field Sample
16114137		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	WC-01	03/18/2016 16:00	Field Sample

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: ClO4=Perchlorate	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

EPA R10 Lab (MEL) COC (REGION COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645339650

CHAIN OF CUSTODY RECORD

Warmhouse Beach Dump RI-FS/WA
Project Code: SFP-095A
Cooler #: 2

No: 10-032116-194358-0044

2016T10P303DD210HVLA00
Contact Name: Brittany Prentice
Contact Phone: 253-335-1661

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
16114140		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	WC-03	03/18/2016 13:30	Field Sample
16114143		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	WC-04	03/18/2016 12:30	Field Sample
16114147		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	WC-05	03/19/2016 12:30	Field Sample
16114150		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	WC-02	03/19/2016 10:10	Field Sample
16114153		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	SP-04	03/19/2016 11:15	Field Sample
16114156		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	US-02	03/19/2016 15:00	Field Sample
16114159		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	USB-01	03/19/2016 15:00	Field Sample
16114162		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	SP-05	03/19/2016 16:35	Field Sample

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: ClO4=Perchlorate	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

EPA R10 Lab (MEL) COC (REGION COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645339650

CHAIN OF CUSTODY RECORD

Warmhouse Beach Dump RI-FS/WA
Project Code: SFP-095A
Cooler #: 2

No: 10-032116-194358-0044

2016T10P303DD210HVLA00
Contact Name: Brittany Prentice
Contact Phone: 253-335-1661

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
16124102		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	SP-03	03/20/2016 10:00	Field Sample
16124105		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	SP-903	03/20/2016 10:30	Field Duplicate
16124108		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C), N2 (< 6 C), N3 (< 6 C) (3)	BKGD-07	03/20/2016 12:45	Field Sample
16124111		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	BKGD-08	03/20/2016 15:30	Field Sample
16124114		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	BKGD-09	03/20/2016 14:40	Field Sample

Sample(s) to be used for Lab QC: 16124108 Tag N1, 16124108 Tag N2, 16124108 Tag N3

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: ClO4=Perchlorate

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645546772

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 23

No: 10-032116-221700-0045

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124123	JHB69	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1309 (< 6 C), 1311 (< 6 C), 1313 (< 6 C), 1315 (< 6 C) (4)	BKGD-02	03/21/2016 15:00	
16124126	JHB71	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21)	1324 (< 6 C), 1325 (< 6 C) (2)	BKGD-03	03/21/2016 16:00	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645546772

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 23

No: 10-032116-222421-0046

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124123	MJHB69	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1297 (HNO3 pH<2) (1)	BKGD-02	03/21/2016 15:00	
16124124	MJHB70	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1317 (HNO3 pH<2) (1)	BKGD-02	03/21/2016 15:00	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645553822

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 24

No: 10-032116-222716-0047

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124126	MJHB71	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1318 (HNO3 pH<2) (1)	BKGD-03	03/21/2016 16:00	
16124127	MJHB72	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1328 (HNO3 pH<2) (1)	BKGD-03	03/21/2016 16:00	
16124129	MJHB73	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1329 (HNO3 pH<2) (1)	BKGD-10	03/21/2016 16:50	
16124130	MJHB74	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1339 (HNO3 pH<2) (1)	BKGD-10	03/21/2016 16:50	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645553822

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 24

No: 10-032116-223059-0048

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124126	JHB71	Surface Water Total/ Mark Endo	Grab	PEST(21)	1326 (< 6 C), 1327 (< 6 C) (2)	BKGD-03	03/21/2016 16:00	
16124129	JHB73	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1335 (< 6 C), 1336 (< 6 C), 1337 (< 6 C), 1338 (< 6 C) (4)	BKGD-10	03/21/2016 16:50	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: PEST=Pesticides TCL, SVOC+SIM=SVOC TCL + PAH SIM

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645561360

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 25

No: 10-032116-223505-0049

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124116	MJHB64	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1272 (HNO3 pH<2) (1)	SP-02	03/21/2016 13:25	
16124117	MJHB65	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1282 (HNO3 pH<2) (1)	SP-02	03/21/2016 13:25	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645561360

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 25

No: 10-032116-223830-0050

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124116	JHB64	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1278 (< 6 C), 1279 (< 6 C), 1280 (< 6 C), 1281 (< 6 C) (4)	SP-02	03/21/2016 13:25	
16124119	JHB66	Surface Water Total/ Mark Endo	Grab	PEST(21)	1291 (< 6 C), 1292 (< 6 C) (2)	SP-902	03/21/2016 14:00	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645570847

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 26

No: 10-032116-224142-0051

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124119	MJHB66	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1283 (HNO3 pH<2) (1)	SP-902	03/21/2016 14:00	
16124120	MJHB67	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1293 (HNO3 pH<2) (1)	SP-902	03/21/2016 14:00	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/22/2016
CarrierName: FedEx
AirbillNo: 782645570847

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 26

No: 10-032116-224314-0052

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124116	JHB64	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1273 (HCl pH <2), 1274 (HCl pH <2), 1275 (HCl pH <2), 1276 (HCl pH <2), 1277 (HCl pH <2) (5)	SP-02	03/21/2016 13:25	
16124119	JHB66	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21)	1289 (< 6 C), 1290 (< 6 C) (2)	SP-902	03/21/2016 14:00	
16124122	JHB68	Water/ Mark Endo	Grab	TVOA+SIM(21)	1294 (HCl pH <2), 1295 (HCl pH <2) (2)	TB-07	03/21/2016 10:00	
16124123	JHB69	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1299 (HCl pH <2), 1301 (HCl pH <2), 1303 (HCl pH <2), 1305 (HCl pH <2), 1307 (HCl pH <2) (5)	BKGD-02	03/21/2016 15:00	
16124126	JHB71	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1319 (HCl pH <2), 1320 (HCl pH <2), 1321 (HCl pH <2), 1322 (HCl pH <2), 1323 (HCl pH <2) (5)	BKGD-03	03/21/2016 16:00	
16124129	JHB73	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1330 (HCl pH <2), 1331 (HCl pH <2), 1332 (HCl pH <2), 1333 (HCl pH <2), 1334 (HCl pH <2) (5)	BKGD-10	03/21/2016 16:50	

Sample(s) to be used for Lab QC: 16124122 Tag 1294, 16124122 Tag 1295

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: TVOA+SIM=TVOA TCL + VOC SIM MA 2454.2, SVOC+SIM=SVOC TCL + PAH SIM

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

EPA R10 Lab (MEL) COC (REGION COPY)

DateShipped: 3/23/2016
CarrierName: FedEx
AirbillNo: 782654066488

CHAIN OF CUSTODY RECORD

Warmhouse Beach Dump RI-FS/WA
Project Code: SFP-095A
Cooler #: 3

No: 10-032216-152349-0053

2016T10P303DD210HVLA00
Contact Name: Brittany Prentice
Contact Phone: 253-335-1661

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
16124134		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	BKGD-05	03/22/2016 11:00	Field Sample
16124137		Surface Water Filtered 0.2um/ Mark Endo	Grab	ClO4(8 weeks)	N1 (< 6 C) (1)	BKGD-04	03/22/2016 11:55	Field Sample

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: ClO4=Perchlorate	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/23/2016
CarrierName: FedEx
AirbillNo: 782654290227

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 27

No: 10-032216-154618-0054

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124135	JHB77	Surface Water Total/ Mark Endo	Grab	SVOC+SIM(21), PEST(21)	1357 (< 6 C), 1358 (< 6 C), 1359 (< 6 C), 1360 (< 6 C) (4)	BKGD-04	03/22/2016 11:55	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/23/2016
CarrierName: FedEx
AirbillNo: 782654290227

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 27

No: 10-032216-154718-0055

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124135	MJHB77	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1351 (HNO3 pH<2) (1)	BKGD-04	03/22/2016 11:55	
16124136	MJHB78	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1361 (HNO3 pH<2) (1)	BKGD-04	03/22/2016 11:55	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/23/2016
CarrierName: FedEx
AirbillNo: 782654310531

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 28

No: 10-032216-154837-0056

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124132	JHB75	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21), SVOC+SIM(21), PEST(21)	1341 (HCl pH <2), 1342 (HCl pH <2), 1343 (HCl pH <2), 1344 (HCl pH <2), 1345 (HCl pH <2), 1346 (< 6 C), 1347 (< 6 C), 1348 (< 6 C), 1349 (< 6 C) (9)	BKGD-05	03/22/2016 11:00	
16124135	JHB77	Surface Water Total/ Mark Endo	Grab	TVOA+SIM(21)	1352 (HCl pH <2), 1353 (HCl pH <2), 1354 (HCl pH <2), 1355 (HCl pH <2), 1356 (HCl pH <2) (5)	BKGD-04	03/22/2016 11:55	
16124138	JHB79	Water/ Mark Endo	Grab	TVOA+SIM(21)	1362 (HCl pH <2), 1363 (HCl pH <2) (2)	TB-08	03/22/2016 10:00	

Sample(s) to be used for Lab QC: 16124138 Tag 1362, 16124138 Tag 1363	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: TVOA+SIM=TVOA TCL + VOC SIM MA 2454.2, SVOC+SIM=SVOC TCL + PAH SIM, PEST=Pesticides TCL	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

USEPA CLP COC (LAB COPY)

DateShipped: 3/23/2016
CarrierName: FedEx
AirbillNo: 782654310531

CHAIN OF CUSTODY RECORD

Case #: 46044
Cooler #: 28

No: 10-032216-154918-0057

Lab: ALS Laboratory Group - Salt Lake City
Lab Contact: Roxy Olson
Lab Phone: 801-266-7700

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
16124132	MJHB75	Surface Water Total/ Mark Endo	Grab	TMet-MS_AES_Hg(21)	1340 (HNO3 pH<2) (1)	BKGD-05	03/22/2016 11:00	
16124133	MJHB76	Surface Water Dissolved/ Mark Endo	Grab	DMet-MS_AES_Hg(21)	1350 (HNO3 pH<2) (1)	BKGD-05	03/22/2016 11:00	

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #

Analysis Key: TMet-MS_AES_Hg=Total Metals TAL: ICPMS, ICPAES, Hg, DMet-MS_AES_Hg=Dissolved Metals TAL: ICPMS, ICPAES, Hg

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt